Monitoring, Verification, and Evaluation (MVE) Unit
of the Egyptian Environmental Policy Program

EEPP Monitoring System 2002 Analysis Report

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EEPP and Related USAID Environmental Work

The Egyptian Environmental Policy Program (EEPP) is working to improve environmental management by improving institutional capacity and reforming environmental policy. It began in 1999 and is being carried out under a bilateral agreement between the Government of Egypt (GOE) and the United States Agency for International Development (USAID). EEPP is now working in four general areas: air quality, solid waste, energy, Red Sea conservation and tourism, and general environmental management. In addition, ongoing USAID work on water resources management in agriculture is to be become the responsibility of the Environment Office in 2003. The Monitoring, Verification and Evaluation (MVE) unit of EEPP has, among its responsibilities, the creation of a system to monitor the environment and impacts of program activities. The monitoring system described in this report addresses that responsibility.

Earlier Monitoring System reports leading to this one include: *The Status of Private Sector Participation in Solid Waste Management Services in Egypt*; *Towards a Common Information Base For Egyptian Red Sea Protection and Development; Building A System to Monitor Protection and Development of Red Sea Ecosystems: Biological Indicators;* and *Development of an Environmental Indicator System for the Egyptian Environmental Policy Program.*

Briefly, EEPP targeted activities involve:

Air Quality: Through the Cairo Air Improvement Project, another USAID/GOE project, and portions of the EEPP energy project, EEPP is helping the Egyptian government to strengthen its air pollution control system. Specific components of the program are working with the government to issue revised ambient and emissions standards, publicize air quality information, initiate the procurement of compressed natural gas (CNG) buses, close the lead smelters in Shoubra el-Kheima, and clean up the toxic wastes left behind.

Solid Waste Management: EEPP is working with three governorates, Alexandria, Cairo, and Qalyubia, on the privatization of solid waste management as a strategy for improving trash collection and handling, and reducing the environmental risks posed by current trash management systems. The work focuses on implementing more effective contracting systems for trash management than those now in place, in that standards and

requirements will be explicit and contractors can be held to them. The expectation is that these will serve as a model to help other governorates put in place more effective private sector contracts as well.

Energy: EEPP is working with the Ministries of Petroleum and Electricity on energy efficiency and reduced greenhouse gas (GHG) emissions. They are doing this through energy policy reform designed to encourage switching from petroleum products to less expensive and cleaner natural gas.

Red Sea Tourism and Conservation: EEPP is working with the Tourism Development Authority (TDA) and private tourism companies to instill more sustainable practices in the growing tourist industry on the Red Sea coast. Among the new practices being introduced are improved practices for management of water and wastewater, better preparation and review of environmental impact assessments (EIAs), better land use planning, and green marketing, and ecotourism. EEPP is also working with the EEAA to improve conservation planning, as well as protection and monitoring in the field, including declaration of protected areas.

Agriculture and Water Resources Management: The Agriculture Policy Reform Program is working on a wide range of issues. Among them is a component focused on management of irrigation water, through which USAID is supporting the establishment of user groups that will manage and finance the maintenance of their own irrigation infrastructure. USAID is also beginning the conceptualization of a new water resources management program, which will be a direct component of EEPP or its successor.

Thus far, EEPP technical assistance in these areas has been more focused on institution strengthening, and to a lesser extent, on legal and regulatory reform. Measuring the impact of this kind of assistance is a challenge, because it does not lead to an immediate and measurable impact on the physical environment. In addition, in order to measure change, it is necessary to have adequate baseline information from before the actions.

Purpose of this Report

The principal focus throughout the report is to present information useful in understanding and assessing the program. Secondarily, in areas where the linkage between what EEPP is doing and what is happening in the sector is less clear, information is presented on the conditions in sectors where EEPP is working. This is useful as context and to establish a baseline for future monitoring. It may also guide decisions about extending EEPP actions in this sector toward on-the-ground effects.

It is important to recognize that the monitoring system is a work in progress. As more data are collected and analyzed, and as EEPP continues implementation, the system indicators will evolve. Some indicators will be refined, others will be eliminated, and some additional indicators may be added.

In addition, to make decisions about other aspects of the environment and, in particular, about which environmental problems are most acute and what are their trends, a system that can manage this information is crucial. At this moment, for USAID and the GOE this is particularly important as planning for a follow-on project to EEPP is undertaken. It should also be noted that the monitoring system created in this present project will, in fact, be able to be continued into the follow-on without discontinuity and without the same investment being necessary. In this way it will be able to provide baseline information on change from the very beginning of the project. Thus it is clear, MVE has been taking the longer view in the design of the system.

By including a wide range of areas in which USAID is active, both those within EEPP or those expected to be integrated into a follow-on to the current program, the intention is to ensure that the system will provide an ongoing monitoring capability that maintains continuity between USAID programs over time.

Within this broad goal, the system has several specific purposes, and includes distinct types of information and indicators to accomplish them:

- The most detailed aim of the system is to track what is happening within EEPP. The USAID Performance Monitoring Plan (PMP) indicators will be included in the system, and will be a major tool to accomplish this aim.
- A somewhat broader aim will be to observe what is happening in the areas targeted by EEPP. Where possible, an effort will be made to include data and develop indicators that actually show the impacts of EEPP activities themselves. In most cases, however, while the information and indicators will be tied to the EEPP policy objectives, it will not be possible to establish a direct causal link between observed physical changes and the program itself.
- A third aim is to follow evolution of the broader environmental context in which EEPP is working. Thus the system will provide general information on environmental quality and management activities in areas such as solid waste, energy, and air pollution. These data will enable EEPP and USAID to assess whether the overall problems that led to the focus chosen by EEPP are becoming better, worse, or staying the same.

The monitoring system includes both simple indicators that can be interpreted easily, and broader information that is essential in order to either calculate or interpret the indicators.

BACKGROUND

MVE Role in EEPP

The role of the MVE unit is to monitor the impact of EEPP policy reforms, verify that EEPP participating agencies have achieved milestones agreed upon to trigger cash disbursements by USAID to the GOE, and evaluate the effectiveness of EEPP

interventions overall. The MVE role, therefore, is primarily one of outside observation and analysis, not of technical assistance. Developing and maintaining the EEPP monitoring system, and preparing annual monitoring reports is part of the unit's role. To do this, MVE carries out analytical work setting baselines in the sectors of focus. MVE also works at the policy level examining cross-cutting issues, and identifying barriers and constraints to policy reform implementation, as well as solutions to overcoming these.

In Tranche 1 (T1), MVE solicited input regarding important cross-cutting problems and one area that was widely identified starting the Environmental Sector Assessment was that of environmental information, specifically the lack of environmental indicators. This also had been mentioned as a priority by the then-Minister of State for Environmental Affairs, on a number of occasions. Because of its Monitoring and Evaluation functions this is an area that is specifically identified as pertaining to MVE actions in the original design for the Unit and its place in the EEPP Program.

Development of the Monitoring System

Over the past years, MVE has worked with USAID and the EEPP partners to develop the EEPP monitoring system. This process began with the identification of a set of environmental indicators, drawing on work done by various entities and for different purposes. These include ongoing efforts within EEAA:

- Egyptian Environmental Information System (EEIS) Project
- Environmental Information and Monitoring Program (EIMP) Project
- Egypt Pollution Abatement Program (EPAP)
- Support to Environmental Assessment and Management (SEAM) Project
- Cairo Air Improvement Project (CAIP).

In addition, efforts within the Government of Egypt (GOE) regularly or on an *ad hoc* basis produce reports on aspects of the environment—including some environmental indicators—such as:

- Report on the State of the Environment
- Reports to the United Nations Environment Program (UNEP) Mediterranean Action Plan (the "Blue Plan")
- Reports to the Arab League
- Preparation of Egypt's National Environmental Action Plan (NEAP)
- Regular reports from specific projects/activities (e.g., the CAIP and EIMP monitoring networks).

USAID routinely tracks and reports on selected aspects of environmental information in Egypt through its PMP process. However, the above-mentioned programs and projects represent somewhat fragmented interventions undertaken to meet one or another specific obligation or to produce reports of limited scope. Although much information has been collected at the project level, this information has not been aggregated or

analyzed in a manner that demonstrates macro-level trends over the long run. Linking and coordinating the different component interventions into one coherent and consistent indicator framework, including the supporting data supply and information systems, remains to be achieved.

The state of environmental indicators and environmental monitoring was documented in an MVE report entitled *Development of an Environmental Indicator System for EEPP*, (December 2001). This report was MVE's first comprehensive step toward developing a monitoring system for EEPP. It included a discussion of attributes of indicators and a draft set of indicators that has since been further refined for the current system. To arrive at this set of indicators, MVE analyzed the EEPP objectives and policy measures to determine what information could effectively and practically be used to determine their impact. Data sources also were identified.

Scope of the Monitoring System

The monitoring system covers a limited set of environmental issues that provide the context for understanding EEPP activities in relevant areas. In order to determine appropriate indicators, MVE analyzed the EEPP policy matrix, including the objectives, policy measures, and means of verification. The indicators cover the following areas:

- Local and global air pollution
- Solid and hazardous waste
- Energy consumption
- Water resources management
- Biodiversity conservation, protected areas, coastal zone management, and tourism, with particular emphasis on the Red Sea
- Environmental protection and management.

Within these areas, the indicators in the system are of several types. Some are specifically designed to monitor EEPP activities, and are narrowly focused on accomplishment of the tasks set out in the program. Others are directed more broadly at tracking the policy objectives of the different components of EEPP. These indicators shed light on how well the objectives of the program are being met, rather than on whether the activities are being carried out as planned. A third set of indicators complements the previous two by providing data on broad trends in environmental quality and management in the areas in which EEPP is working. Finally, the indicators related to water resources management, address broad environmental trends in areas where EEPP expects to become active in the future.

REPORTING METHODOLOGY

The report is divided into separate sections for each sector that the system is being used to monitor. These sectors cover the areas in which policy reform is being undertaken and technical assistance is being provided under EEPP. They include:

A. Air Quality Management
B. Solid and Hazardous Waste Management
C. Energy Management
D. Water Resources Management
E. Coastal Zone Management
F. General Environmental Management

For each sector or indicator area, the following sections are addressed:

- Brief background and historical context for the sector (viz. GOE and EEPP Policy Objectives)
- Description and analysis of indicator data with an examination of the gaps in available data and additional information needed
- Conclusions that could be drawn from the data, including predictions of what date likely would show, if available.

Each section of this report looks at the principal problems in the sector and what EEPP is trying to accomplish to reduce identified problems. For each indicator, MVE worked with EEPP partners to obtain the necessary data. In most cases, data were actually either incomplete or unavailable. However, all data obtained was then organized into tables for the relevant sector, according to the monitoring system framework.

Available data were analyzed to determine trends and, to the extent possible, to determine the impact of EEPP interventions. The analysis also looks at whether the indicators presently designed are adequate to measure impact in the future. In some cases, the analysis might show that the indicators should be adjusted or that different indicators would be better. In either case, any changes to the indicators must be weighed against the practicality of obtaining the necessary data in the future. Plans for improving these indicators and data sets are included.

SOME INTERIM CONCLUSIONS

To the extent that it is possible to draw conclusions from the data about the impact of EEPP interventions, MVE has attempted to do so. In many cases, the data are too incomplete to draw conclusions. In other cases, the indicators themselves are not realistic and likely will have to be adjusted or deleted. These conclusions are not unexpected, given that this is the first year that this monitoring system has been implemented. It is likely that the system will continue to progress over the next several years to become a more effective management and planning tool.

Overall, in creating this report, MVE found that it is not yet possible to ascertain and monitor the impact of an environmental project of this size, scope, and complexity in Egypt. Basically, the institutional information infrastructure does not yet exist and consequently, the data and information do not yet exist.

Nevertheless, a start can be made on a comprehensive Monitoring System. Some data on the actions of the program can be monitored. This would include inputs and simple outputs, among these are be mooring buoys affixed or Rangers hired or Best Practices adopted. And some environmental conditions can be measured, including air quality in the Greater Cairo Region and water quality at specific locations in the Red Sea. Beyond this, in 2002 little is known about the actual conditions of most of the coral reefs of the Red Sea. Only now is a program to set baseline conditions being implemented. Before this no one could say if the present conditions actually represent a measurable decline in quality though people who have been there testify that this is the case. This is not all bad. In fact, it is probably better to get some programs for protection started even before perfect information about pre-existing conditions is available, if only because in conditions of pressure, the longer one waits for better information, the more damage occurs.

Table 1 Egyptian Environmental Policy Program Indicators

Subject Area	Indicator
Air Quality Management	Total Stationary Source Lead Emissions in Greater Cairo Region (PM 1.1)
	Total Mobile Source Emissions in Greater Cairo Region
	Indicator A.1.1 Percent of Code Red Days in a Quarter or Year (possible future indicator)
	Ambient Air Quality in GCR for Identified Pollutants (PM 1.1)
	Indicator A2.2 Percentage of New CTA Buses Procured that use CNG
	Indicator A2.1 Number of Cairo Municipal Transit Buses using CNG
	Indicator A3.3 Lead (Pb) Concentrations
	Percent of vehicles (private, taxis & microbuses)and municipal Transit Buses in Egypt Using CNG (PM 1.2)
	Number Lead Smelting Facilities Decommissioned in Shoubra (PM 1.3)
	Total Greenhouse Gas Emissions
	Production /Consumption of Ozone-Depleting Substances
Solid and Hazardous Waste Management	Number of Tons of Solid Waste Generated, Collected, Disposed, Diverted (Recycled) and Accumulated in EEPP Targeted Governorates
	Indicator B3.2.1 Total solid waste generated
	Indicator B3.2.2 Solid waste disposed of in landfill, recycled, or otherwise diverted
	Indicator B3.2.3 Street solid waste collected
	Number of Tons of Solid Waste Accumulation Collected in EEPP Targeted Governorates
	Indicator B3.2.4 Volume of solid waste accumulated in the streets
	Indicator B3.3.2 Solid waste collected by the private contractor
	Number of Governorates w/ at Least One New Private Sector SWM Contractor (PMP)
	Percent of Population that Believes that it is his/her responsibility to Keep the Streets Clean
	Indicator of Economic Efficiency of Private SWM Contractors
	Number of Permits Issued by CAA for Disposing Hazardous Waste (PM 5.1)
	Indicator B5.2 Tons of Hazardous waste permitted under permits
	Number of Tons of Hazardous Waste Disposed Of Under Permits(PM 5.1)
Energy Management	Natural Gas Consumption by sector (as Quantity and % Total Energy Consumption) (PM 10.1)
	Indicator C3.1 Total Primary Energy Production by Energy Source
	Indicator C3.2 Total Primary Energy consumption by energy source
	Indicator C3.3 Final Energy Consumption by End-use Sector
	Indicator C3.4 Natural Gas Consumption as Percent of Total Energy Consumption
	Indicator C3.5 Natural Gas Consumption by End-use Sector

Subject Area	Indicator
	Indicator C3.6 Natural Gas Consumption for Generating Electricity
	Indicator C3.7 Electrical power generated from Renewable Natural Resources
	Indicator C3.8 Volume of CNG sold for transportation
	Indicator C3.9 Increase in Natural Gas Use in Governorates where EEPP is working (possible future indicator)
	Indicator C3.10 Increase in Natural Gas Sales by Local Distribution Companies with which EEPP is Working versus other LDCs (possible future indicator)
	Indicator C3.11 Percent of respondents who are aware of energy efficiency
	Indicator C3.12 Number of Private or Quasi-Private Sector Companies Providing Energy Efficiency Service
	Total Volume of CNG (1000 GGE) Sold for Transportation
	Final Energy Demand / Consumption by Sector and Energy Source
	Percent of Electrical Power Generated from Renewable Energy Sources
	Total Energy Supply from All Sources
	Percent of Respondents Who Are Aware of Energy Efficiency
	Cumulative Increase in Number of Private/Quasi-Private Sector Companies Providing Energy Efficiency Services
Water Resources Management	Consumption of Surface and Groundwater by Sector
	Water Use Per Unit of Output by Sector
	Real Value of Agricultural Production Per 1000 cubic meters of Nile Water Used
	Irrigated Feddans Where Water is Managed through Participatory Processes
Coastal Zone Management	Number of Tourist Nights in RS Governorate (incl projections)
	Number of Dive Trips (NZ/SZ/RS) (incl projections)
	E4.3.1. Number of qualified EEAA rangers in RS Governorate
	E4.3.2. EEAA annual budget for Red Sea conservation
	E4.3.3. Value of fees collected for natural resources including the Red Sea Protectorate
	E4.3.4. Revenues from diver and snorkeler fees in Red Sea
	E4.3.5. Number of mooring buoys established in the Red Sea Region
	E4.3.6. Percent of tourist facilities with approved EIAs before construction
	E4.3.7 Percentage of Hotel Rooms in facilities located on TDA-owned land in the Red Sea region, which instituted Best Practices
	E4.4.1 Coastal water quality
	E4.4.2. Coral Reef Quality and Extent in the Red Sea region
	Value of Fees Collected for Natural Resources
	EEAA annual Budget for Conservation in General/RS Conservation in Particular
	Percent of Respondents Who Can Identify at Least One Way to Preserve the RS

Subject Area	Indicator
	Percent of Tourist Facilities w/ Approved EIAs before Construction (PMP) (breakdown for the Southern Zone (PM 7.1)
	Percent of Hotel Rooms in Facilities on TDA-Owned Land in the RS Region w/ Best Practices (PMP) (breakdown for the Southern Zone (PM 7.1 and PM 9.1))
	Number of Qualified EEAA Nature Protection Rangers assigned to Work in the RS Governorate (PMP)
	Percent of all costs associated w/ Hurghada/Quseir Ranger Operations covered by EEAA Resources (PM 2.1)
	Total Revenue from Diver/Snorkeler Fees from Sites in RS Northern Zone (PM 2.2)
	Total Number of Mooring Buoys in the RS (a) Northern Zone and (b) Southern Zone (PM 2.3)
	Area covered by Public/Private Partnerships Managing/ Conserving RS Resources in the (a) Northern Zone and (b) Southern Zone (PM 2.3)
	Number of RS Tourism Developments for which EIA Environmental Monitoring Plans are being implemented and Number of those cited by TDA for non-compliance with EIA conditions.(PM 8.1)
	Coastal Water Quality (measuring specified parameters)
	Coral Reef Quality and Extent, including sites around Giftuns and Adjacent Islands and Southern Zone (PM 2.2)
General Environmental Protection	Planned Gov't Investment in Environmental Protection
	Indicator F3.1.1 Index Number of EEAA Regional Branch Offices (RBOs) Operational and Performing Core Environmental Management Functions
	Indicator F3.1.2 Allocation of EEAA Funds between Cairo and Regional Branch Offices (RBOs)
	Indicator F3.1.3 Allocation of EEAA Staff between Cairo and Regional Branch Offices (RBOs)
	Indicator F3.1.4 Number of Inspections by EEAA (disaggregated by Central/RBO)
	Indicator F4.1: Planned Government Investment In Environmental Protection
	Indicator F 4.2: Government Expenditure in Environmental Protection
	Indicator F 4.3: Environmental Protection Fund (EPF) Revenue by Source
	Indicator F 5.1: Government Employment in Environmental Protection
	Indicator F6.1: Percent Of Policy Reform Tranche Value Achieved
	Indicator F6.2 Number of Accredited Environmental Laboratories
	Gov't Employment in Environmental Protection
	Gov't Expenditure in Environmental Protection
	EPF Revenue by Source (PM 3.1)
	Financial Implications from Implementation of Economic Instruments (PM 3.2)
	Allocation of EEAA Funds between Headquarters and RBOs
	Allocation of EEAA Staff between Headquarters and RBOs

Subject Area	Indicator
	Number of Inspections by EEAA (PM 5.2) (disaggregated by central/RBO)
	Percent of Policy Reform Tranche Achieved
	Index Number of EEAA RBOs Operational and Performing Core Environmental Management Functions

A. Air Quality Management

PRINCIPAL PROBLEMS

Air pollution significantly affects human health and constrains economic growth. Ambient air quality in Cairo is among the worst in the world. It contains high levels of pollutants associated with mobile and stationary source fossil fuel combustion. In addition, Cairo's ambient air has very high level of lead from the local lead smelting industry.

EEPP TRANCHE 2 POLICY MEASURES

- Provide technical assistance to GOE on development of a National Air Quality Strategy
- Demonstrate the technical and financial feasibility of using CNG-powered buses in Cairo
- Discontinue lead smelting in Shoubra and conduct pilot remediation activities.

PROPOSED EEPP MONITORING SYSTEM INDICATORS

- Number of code red days
- Air quality monitoring data
- Number of CNG-fueled mass transit buses
- Percentage of new buses purchased that are fueled with CNG
- Number of lead smelters decommissioned in Shoubra el-Kheima
- Quantity of stationary source lead emissions in Greater Cairo

A.1 BACKGROUND

Poor air quality is a major concern in Egypt, particularly in Greater Cairo and other urban areas. Particulate matter (PM) is the most serious air pollutant from the standpoint of human health. Peak concentrations are more than 10 times the Egyptian standard, 7 times the U.S. standard, and 20 times the European Union norm. Nitrogen dioxide

(NO_2) and sulfur dioxide (SO_2), while not consistently exceeding standards are of concern because high emissions of these pollutants are converted almost immediately upon release to the atmosphere to fine PM. NO_2also plays a key role in the formation of ozone (O_3), a significant problem in Greater Cairo. Ambient concentrations of carbon monoxide (CO) regularly exceed applicable standards. While significant progress has been made in reducing lead emissions, the average measured ambient concentrations still exceed the Egyptian standard by a factor of four and the World Health Organization (WHO) norm by a factor of eight. Other toxic metals such as cadmium, chromium, and nickel also are detected in Cairo's air.

Important sources of emissions include vehicles, stationary sources, burning of trash and agricultural waste, re-suspension of dust, and wind-borne dust. Cairo's vehicle fleet is antiquated in terms of its pollution control technology and its fuel is high in vapor pressure and sulfur content. Ambient concentrations of pollution are made worse by local meteorological conditions such as climatic inversions.

To address some of these air quality concerns, Egypt has switched to unleaded gasoline and has closed several small lead smelters.

A.2 EEPP Policy Measures

EEPP is currently working in Tranche 2 to address air quality management challenges in Greater Cairo through several initiatives with specific policy objectives, which include the following:

G. **Provide technical assistance to the GOE on development of a National Air Quality Strategy (Objective 1).** EEPP is helping the GOE to revise air quality standards and to put in place the procedures and develop the ability to revise these standards themselves. EEPP is also helping to set the lead emissions standards, and to close or move lead smelters. The objective also promotes the use of compressed natural gas (CNG) to fuel public buses in Greater Cairo. Through the Cairo Air Improvement Project (CAIP) and portions of the EEPP energy project, EEPP is helping the GOE to strengthen its air pollution control system. The overall objective of the two programs is to improve ambient air quality for identified pollutants.

A.3 Overall Conclusions Based on Indicators

In general, in the area of Air Quality Management, there is good data on air quality in Cairo at least, especially in the specific places that there are stations with a real measuring and monitoring system in place with good historical data. Data on emissions of interest to the global community are not good, mostly because of the lack of data on emissions from industrial facilities. This is related to an inadequate inspection program.

A.4 INDICATORS

A.4.1 Background

Air quality is being monitored at 39 sites in the Cairo area and 42 sites throughout the rest of the country, through systems established, respectively, by the Cairo Air Improvement Program (CAIP) and the Environmental Information Monitoring Program (EIMP). Regular reports provide monthly, quarterly, and annual updates on air quality and discuss factors that explain extreme incidents or other changes over time.

Simplifying these data into a manageable set of indicators requires some choice, as the amount of data available is substantial. Moreover, some apparently simple aggregations are not possible. It is not meaningful to add data about different pollutants, since each has different causes and consequences, so they must be tracked separately. It is also not meaningful to add observations from different parts of the country, as air pollution is a local phenomenon and it is essential to know where it occurs.

Three simplifying indicators would give a quick snapshot of how well the country is doing in its efforts to control air pollution:

- The percent of observations on each pollutant at each location that exceed the applicable standards over the course of the year.
- The amount by which applicable standards are exceeded. This could be indicated by providing the mean and standard deviation of the observations for each location over the course of the year.
- The spatial location of sites where air quality measurements exceed the standards.

These three measures offer a fairly simple overview of the magnitude of the problem, without combining items that cannot be aggregated. Time series data on these indicators, particularly on the first two, will show whether the country is making headway in dealing with the problem.

Unfortunately, the EIMP's published reports do not provide the actual air quality measurement data. They do provide some summaries, data on the highest observed levels, and valuable information on unexpected spikes or other anomalies in air quality. However, the full underlying data set is required in order to calculate the three indicators suggested above, so this can not be done until the data are obtained.

What are presented below are not complete statistics for each pollutant but summarized statistics for each year. Complete month-by-month and station-by-station statistics can be found in the report annexes or in the original CAIP or EIMP reports.

The EIMP has been tracking the concentration of the six main pollutants in the air at selected monitoring sites in Greater Cairo, the Canal Cities, Upper Egypt, and Sinai since 1999. The CAIP has been monitoring the ambient air concentration of suspended particles and lead at 34 measurement sites located in the greater Cairo since 1998.

For each pollutant, two important indicators can be derived from the current data: percent decrease (or increase) in concentrations of each pollutant, and the number of times the measured concentration exceeds the standard value for a given measurement period.

The first will reveal if the air quality continues to improve (or deteriorate) based on the analysis of the trend. The second identifies the communities (sites) where a given pollutant is posing risks to human health and the environment, and therefore some enforcement procedures would be needed to control emissions.

A.4.2 Manage Air Quality

How would the Monitoring System (MS) monitor the impact of the development of a National Air Quality Strategy (NAQS)? Developing quantitative indicators of institutional change or policy development is always among the most difficult tasks in an MS.

While it would be possible to track the number of air quality standards created or changed, it would be more useful to report on the status of the actual air quality and air emissions standards versus international norms. This is shown in table A-1.

Tracking the development of the NAQS over the life of the tranche or a subsequent period is the job of quarterly progress reports and such from the technical contractors. For the EEPP Monitoring System, 2002 reports on the status of the development of an NAQS will show that the GOE is working on the various studies and on redefining standards by listing when standards were last set. The 2003 reports should show that certain of the standards have been revised. A 2004 report would show that the NAQS has been completed and is being implemented.

Aggregation of the values of major air pollutants in one index would give a quick snapshot of how well the country is doing in its efforts to control air pollution at each location. An Air Quality Index was designed and proposed to the EEAA Board of Directors, where it was approved, and sent by the Minister of State for Environmental Affairs to the Prime Minister for review and approval before it can be used officially. This index, once available, will be used for tracking air quality in general.

Recommendations for related work would include updating the Comparative Health Risks study. The CAIP Project is planning on carrying this out beginning in 2002.

However, it should be noted that it is not possible that the NAQS or any other policy change contemplated will have any direct effect on the national statistics within any relevant time period, so the impact of the program will be difficult to determine.

Indicator A.4.2.1 Management of Air Quality

In the 2003 MS report, such an indicator might be "Percent of Code Red Days in a Quarter or Year," for example. Once years of data existed then it might be possible,

because of the high seasonal variation, to track and compare the percent of red days in a specific month or season versus previous year (e.g., October 2002 vs. October 2003 vs. October 2004).

The GOE has begun to monitor a variety of ambient air quality indicators for pollutants that are monitored in most other countries. Current data on these indicators will provide a useful baseline for tracking changes in air quality through time and indicate what pollutants have reached dangerous levels and where. This information will help the GOE in defining which pollutants and emission sources will be given priority and how vigorously it intends to enforce regulatory programs. It will also help track the ultimate impact of the EEPP in terms of working with the GOE to issue revised ambient air quality standards and stationary source lead emission standards.

Air quality has been monitored since 1999, at 37 sites in the Greater Cairo area and 42 sites throughout Egypt. It has been monitored through systems established, respectively, by CAIP, sponsored by USAID, and the Environmental Information and Monitoring Program (EIMP) sponsored by Danish International Development Assistance (Danida). The selected sites represent different area types: industrial areas, urban city centers, streets and roadsides, residential areas, regional and background areas, and mixed areas. Updates on each pollutant are included in regular reports prepared monthly, quarterly, and annually.

The main air pollutants monitored by the EIMP include those most commonly measured in many countries to assess ambient air quality: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), suspended particles with a diameter less than 10 micrometer (PM^{10}), and lead (Pb). Not all parameters are being measured at all sites. This is dependent upon site specifications and typical dominating sources in the specific area. These pollutants are emitted by mobile sources, such as cars and buses, and stationary sources, such as industrial plants.

CAIP has been monitoring the ambient air concentration of suspended particles and lead in 34 measurement sites located in Greater Cairo since 1998.

Knowing the maximum levels of various pollutants that have a negative environmental effect is critical for the development of regulatory measures and quality standards to protect public health. The Egyptian standards to be achieved with respect to air quality are established by the regulations promulgated under Law 4/1994. The maximum levels accepted for some pollutants are higher than the international standards (see table A-1). Developing air quality standards is a policy measure ultimately linked to scientific data that clarify the link between a specific concentration of a pollutant and its effect on public health. These scientific data have not been developed in Egypt, but a broad range of studies is available elsewhere.

Table 2 constitutes the baseline for tracking the policy process of adopting new air quality standards to measure the impact of the EEPP Policy Objective 1. The MS will not report on the status of the development of the policy over the life of the tranche

except as shown in new standards. Eventual changes in standard values of main pollutants will be reported in the year when the new standards are adopted. Additionally, the MS will report on actual measurements from CAIP and EIMP.

Table 2 Comparison of Ambient Air Quality Standards and Observations in Egypt, 2002

Pollutants	Standards in $\mu g/m^3$		Observations
	WHO	Egyptian	Egyptian Standards are:
Sulfur Dioxide (SO_2)			
24 hours	125	150	20% higher
annual	50	60	20% higher
Nitrogen Dioxide (NO_2)			
1 hour	200	400	100% higher
8 hours		150	
annual	40-50		
Ozone (O_3)			
1 hour	150	200	33% higher
8 hours	120	120	
Carbon Monoxide (CO)			
1 hour	30,000	30,000	Same
8 hours	10,000	10,000	Same
Total Suspended Particulates (TSP)			
24 hours	150	230	53% higher
annual	75	90	20% higher
Suspended Particulates < 10 μm (PM^{10})			
24 hours	70	70	Same
annual	40 *		
Lead			
annual	0.5-1	1	Higher
Black Smoke			
24 hours	(none)	150	
annual	(none)	50	

Unfortunately, no general emissions data are currently available in Egypt (though CAIP does measure lead emissions). For future editions of this report the MS team could investigate the possibility of developing emissions estimates based on available technical data about Egyptian industry and vehicles and emissions coefficients from other comparable countries. With such data, it would also be possible to make initial estimates about the costs that emissions reductions would impose on different parts of the economy. This is a standard way to obtain initial emissions estimates for policy purposes,

and has been used in many other countries. This would also be useful technical assistance to EEAA.

A.4.3 Monitor Air Quality

Air quality in Egypt is a much bigger problem than can be solved by CAIP, EEPP, or any other USAID or other donor assistance. This is why U.S. assistance thus far has been directed at building the base for Egyptian management of air quality by constructing a monitoring network, conducting studies and revising standards, and funding pilot programs such as the CNG buses and lead smelter relocation and remediation program.

The effect of most of this work will only happen in the future and may never be measurably distinguishable from changes caused by many other factors such as population growth, economic growth, or policies, such as encouraging settlements outside of greater Cairo. Nevertheless, to show the size of the problem and to see if any relationships can be found, the EEPP MS will contain data on general air quality.

In the absence of any new efforts to reduce pollution, the MS will expect the indicators of pollution in discussed throughout this section to rise over time as the level of industrial activity and number of cars rises. If they do not, that will certainly be good news, but there is no reason to expect them not to. The increases over time will serve as a warning—as if any were needed—of the importance of major efforts to reduce air pollution.

Air quality standards will be the prelude to defining the emission standards needed and then prescribing the acceptable emissions from important sources of air pollution. Tracking emissions of key air pollutants is fundamental to developing and monitoring an effective air pollution control system. In order to target pollution reduction efforts and evaluate their effectiveness, it is essential to have ongoing data about who is emitting how much of which pollutants. Such data are also necessary if the country hopes to use any kind of financial instruments to manage pollutant emissions, or wishes to analyze the economic impacts of more stringent air pollution emissions limits.

Lowering the maximum limits of a given pollutant by a few units may have a huge economic impact in terms of additional costs in pollution control technologies and implementation of new standards may require several years. The targeted impact in terms of reducing air pollution would be achieved in the long run, after the policy is enforced.

Indicator A.4.3.1 Total Mobile Source Emissions in the Greater Cairo Area

Cairo has among the worst air pollution in the world in terms of suspended particles and lead. Mobile source emissions from fossil fuel combustion are the major contributor to this air pollution. Adopting the use of cleaner fuels such as unleaded gas and alternatives, such as CNG, and enforcement of pollution regulations backed up by vehicle emission testing can help reduce mobile emissions.

Unfortunately, no emissions data are currently available in Egypt. Emissions estimates of major pollutants can be developed based on technical data about mobile transportation sources and about other sources (fuel combustion, waste disposal, and industrial processes). This kind of data is necessary for prescribing the acceptable pollutant emissions from important sources of air pollution. Mobile sources are only one part of the emissions and these are least known.

Mobile source emissions are estimated by combining known information about the type of vehicle, the fuel it uses, and the quantity of fuel burned or miles traveled. These types of data are available and are being used to estimate mobile source greenhouse gas emissions, so it should be possible to do the same for other mobile source pollutants. Standard emission coefficients used widely throughout the world are available from the United States Environmental Protection Agency (USEPA).

For lead, the quantity of emissions should be observed to drop from the year 1997, when the switch to unleaded gas occurred. If the data exist before that year, then the MS will expect to see a drop in emissions from that point. However, since emissions are probably estimated based on fuel mix and vehicle type, this would in fact be an estimated drop rather than a measured one anyway; it would essentially reflect the vehicle mix and estimated miles driven.

More interestingly, the MS should see a link between this indicator and that of Ambient Lead in Cairo (Indicator A.4.3.2), again only if the air pollution data go far enough back in time to provide a baseline for the switch to unleaded gas. If the data do not precede the switch to unleaded gas, then the primary interest of this indicator will be to compare the relative importance of mobile and stationary sources in emissions. This will be one criterion for identifying priorities for future efforts to reduce emissions.

With respect to the pilot work on CNG buses in Cairo, it should be remembered that the overall Cairo air statistics will not be influenced by the pilot program on CNG buses either during the lifetime of EEPP or even during that of any successor. It is known that CNG buses are less polluting so the point of the pilot work is only to show that the CNG-powered buses are technically and financially feasible for the municipal bus company in Cairo. If the pilot program does set in motion a large-scale conversion to CNG buses in Cairo, this should eventually have a positive effect on air quality in Cairo though it may not ever be directly measurable or attributable to the CNG buses. In any case, for the foreseeable future, the largest effect from CNG used in transportation will be from the 37,000 taxis that are fueled by CNG as of 2002.

Work for 2003 includes verifying bus data, getting better mobile source data/estimates, and getting figures from technical and economic feasibility studies.

Indicator A.4.3.2 Lead (Pb) Concentrations

In September 2001, CAIP produced a report that includes the results of lead measurements in its 34 ambient monitoring stations for 1999 and 2000. The annual

average mean concentration of lead (Pb_{10}) from all measurement sites in Greater Cairo was 4.4 μg/m^3 in 1999 and 2.0 μg/m^3 in 2002 (see table 3). The highest annual average value of lead concentration was 45.4 μg/m^3 recorded in Shoubra el-Kheima in 1999, where several lead smelters are located.

Table 3 Annual Average Lead (Pb10) Concentration in Greater Cairo

Year	Concentration
1999	4.4 μg/m^3
2002	2.0 μg/m^3

Source: CAIP

The report indicated that the annual average lead concentration (Pb_{10}) exceeded the standard value (1 μg/m^3) at 15 of the 34 CAIP ambient monitoring stations. The Pb_{10} concentration maps for 1999 and 2000 showed a limited part of the area along the Nile River, from downtown Cairo in the North to Tebbin in the South, is generally exposed to high Pb_{10} concentrations, especially in the Shoubra el-Kheima area and in Tebbin.

Shoubra el-Kheima is one of the more industrialized areas in Egypt, and emission of a variety of air pollutants can be seen from a number of small and large enterprises. The measurement site in Shoubra el-Kheima is located at the southern part of Qualubeya Governorate.

Needless to say, it would be a good idea if monitoring stations were set up in the new area outside of Cairo where the smelters (and other industry) are going. Then the MS could really get baseline data.

Indicator A.4.3.3 Carbon Monoxide (CO) Concentrations

Carbon monoxide is a poisonous gas produced by the incomplete combustion of carbon in fuels. High concentrations of CO in ambient air can enter the human bloodstream and reduce normal delivery of oxygen to organs and tissues. Automobile exhaust comprises the majority of CO emissions in Cairo, particularly in local areas with heavy traffic congestion.

In 2000, the CO concentration was monitored by EIMP at four sites. The average annual concentration in these stations were:

El-Gomhoriya	7.4 μg/m^3
Fum el-Khalig	4.7 μg/m3
IGSR	3.3 μg/m^3

CO standard values were often exceeded at both El-Gomhoriya and Fum el-Khalig. The 8-hour standard was exceeded 1,947 times (or 25.9 percent of the measuring periods) in El-Gomhoriya and 337 times (or 4.4 percent of the measuring periods) in Fum el-Khalig.

The main source of CO emissions is from mobile transport. Traffic jams and congestion in the busiest streets are probably the main reasons for these relatively high concentrations.

Indicator A.4.3.4 Nitrogen dioxide (NO_2) Concentrations

NO_2 plays a major role in atmospheric reactions that produce harmful ground level ozone, acid deposits, and nitrogen loading that affects both aquatic and terrestrial ecosystems. NO_2 is emitted when fuels burn at high temperatures.

In 2000, the NO_2 concentration was monitored by EIMP at 14 sites. The highest annual average NO_2 concentrations were recorded at sites impacted by traffic such as:

El-Gomhoriya	93 $\mu g/m^3$
El-Kolalay	83 $\mu g/m^3$
Fum el-Khalig	75 $\mu g/m^3$
Nasr City	58 $\mu g/m^3$

The NO_2 24-hour limit value was exceeded 42 times (or 13.2 percent of the measurement periods) at El-Gomhoriya and 5 times (or 1.4 percent of the measurement periods) at Nasr City.

Indicator A.4.3.5 Ozone (O_3) Concentrations

Ozone is a major component of photochemical smog formed from nitrogen oxides (NO_X), volatile organic compounds (VOCs), and oxygen in the presence of sunlight and heat.

High concentrations of ozone at ground level are a major human health concern. Exposure to ozone in excess of standards for several hours can be associated with abnormal functioning of the lungs, which causes chest pain, sneezing and pulmonary congestion. Ozone also can damage crops and forests. Fuel combustion from motor vehicles is the major generator of NO_X and VOCs.

In 2000, the O_3 concentration was monitored by EIMP at five sites. The average annual concentration in these sites were:

Abbasiya	68 $\mu g/m^3$
Aswan	58 $\mu g/m^3$
Ras Mohammed	82 $\mu g/m^3$
Alex Regional	60.3 $\mu g/m^3$
Cairo University	55 $\mu g/m^3$

The O_3 8-hour limit was exceeded at four of five sites: Abbasiya, Cairo University, Aswan, and Ras Mohammed. Abbasiya and Ras Mohammed recorded the highest occurrence of values exceeding standards. The 8-hour limit value was exceeded 288 times (or 10.5 percent of the measuring periods) in Abbasiya and 848 times (or 12.7 percent of the measurement periods) in Ras Mohammed.

Indicator A.4.3.6 Sulfur dioxide (SO_2) Concentrations

High concentrations of SO_2 in the air can aggravate existing respiratory and cardiovascular disease. SO_2 is the main cause of acidification (acid rain) of lakes and streams and is damaging to trees and crops. Sulfur dioxide emissions in the air result largely from fuel and coal combustion from stationary sources such as steel mills, refineries, nonferrous smelters, and power plants.

In 2000, the SO_2 air concentration was measured by EIMP at 17 sites. The sites where SO_2 concentrations exceeded standard limits (60 $\mu g/m^3$) included:

El-Kolaly	65 $\mu g/m^3$
Shoubra el-Kheima	67 $\mu g/m^3$
Kom Ombo	68 $\mu g/m^3$

The 24-hour average concentration limit (150 $\mu g/m^3$) was exceeded in four sites. Kom Ombo (33 times or 9.43 percent of the measuring periods, El-Gomhoriya (14 times or 4.07 percent), Shoubra el-Kheima (2 times or 0.62 percent), and Tebbin South (1 time or 0.33 percent).

Diesel buses and open-air waste burning are the suspected main sources of SO_2. In the streets of Cairo, SO_2 concentrations may approach, and in some conditions, exceed the air quality limit value for Egypt.

Indicator A.4.3.7 Concentration of suspended particles with diameter less than 10 micrometer (PM^{10})

Suspended particles include dust, dirt, smoke, and liquid droplets. They are emitted directly into the air by factories, cars, construction activities, fires, and wind-blown dust. High concentrations of particulates can cause human health risks such as aggravation of breathing and respiratory symptoms.

Suspended dust (measured as PM^{10} and TSP) has been demonstrated to be the major air pollution problem in Egypt. In September 2001, CAIP produced a report that includes the results of PM^{10} values at its 34 ambient monitoring stations for 1999 and 2000.

According to CAIP monitoring, the annual average PM^{10} concentration in the Greater Cairo was 175.5 $\mu g/m^3$ in 1999 and 179.16 $\mu g/m^3$ in 2000. The highest levels of PM^{10} were found in industrial areas and close to traffic. The highest annual average PM^{10} concentration (391.1 $\mu g/m^3$, which is 10 times the air quality limit value in Europe) was recorded in Shoubra el-Kheima during 1999.

The most serious violation of air quality limit values occurred for suspended dust. The 24-hour PM^{10} standard value (70 μg /m^3) was exceeded in all monitoring stations in 1999 and in 33 of 34 monitoring stations in 2000.

Indicator A.4.3.8 Total Greenhouse Gas Emissions

Human activities can affect global climate change through increased emissions of heat-trapping gases called greenhouse gases. According to the Intergovernmental Panel on Climate Change (IPCC), the main greenhouse gases include carbon dioxide (CO_2), methane (CH_4) and nitrous oxides (N_2O). The increasing emission levels of these gases will progressively trap more of the earth's heat, gradually causing global climate warming, with potential for increased weather variability and a rise in sea level. Worldwide, fossil fuel combustion is the principal source of greenhouse gas emissions and carbon dioxide is the major greenhouse gas, accounting for about half of the total warming effect.

Green house gases are regulated under the evolving Framework Convention on Climate Change. The Kyoto Protocol treaty, forged in 1997 (which was a follow-up on the climate change treaty initiated at the Rio Earth Summit in 1992), calls for cutting the greenhouse gases in developed countries by 5 percent by 2008–12 from their 1990 levels. Each signatory to that convention is asked to estimate its emissions for a baseline year of 1990 and to track them over time.

One of the specific policy objectives of EEPP is to reduce emissions of greenhouse gases by promoting the use of cleaner energy sources and contributing to energy efficiency codes and standards. The policy measures include encouragement of the expansion of domestic use of natural gas and establishment of compliance guidelines to promote energy efficiency in the design of new buildings.

At present, only the 1990–91 baseline data, issued by EEAA in November 1998, are readily available in published form. EEAA has established institutional mechanisms for annual updates of emissions and it is currently in the process of collecting the required data from the relative authorities/institutions. It produced a short summary report on greenhouse gas emissions from the energy and wastes sectors in 1999–2000.

Greenhouse gas emissions are generally estimated based on empirical information about economic activity and fuel consumption combined with standard coefficients provided by IPCC. The greenhouse gas emissions are generally measured in Kiloton (Kt) or Gigagram (Gg) of CO_2 equivalent.

Table 4 shows that the total greenhouse gas emission in Egypt was 116,608 Gg in 1990–91. The energy sector, which depends mostly on the combustion of fossil fuel, is the largest source of greenhouse gases, with emissions accounting for 71 percent of the total. The remaining sources include agriculture (15 percent), industrial processes (9 percent), and wastes (5 percent). Carbon dioxide was the major greenhouse gas with 71 percent contribution to the total greenhouse gases in 1990–91. Methane and nitrous oxide

contributed by 19 and 9 percent, respectively to the total greenhouse emissions in 1990–91.

Table 4 Greenhouse Gas Emissions by Sector, FY 1990–91

Sector	Gas	Emissions (Gg)	CO_2 Equivalent (Gg)	Gas Share in Grand Total Emissions	Sector Share in Grand Total Emissions
Energy	CO_2	74,682	74,682	88.4	
	CH_4	206	4,326	20.1	
	N_2O	12	3,720	35.3	
	Sub-Total		82,728		71
Industrial Processes	CO_2	9,777	9,777	11.6	
	CH_4	9	189	0.8	
	N_2O	1	310	2. 9	
	Sub-Total		10,276		9
Agriculture	CO_2			-	
	CH_4	543	11,403	52.8	
	N_2O	21	6,510	61.8	
	Sub-Total	-	17,913		15
Wastes	CO_2	-	-	-	
	CH_4	271	5,691	26. 3	
	N_2O	-		-	
	Sub-Total		5,691		5
Total Emissions	CO_2	84,459	84,459		72
	CH_4	1,029	21,609		19
	N_2O	34	10,540		9
	Grand Total		116,608		100

Reference: Egypt National Greenhouse Gases Inventory 1990/1991.

Carbon Dioxide—The total emission of carbon dioxide in the atmosphere reached 84,459 Gg in 1990–91, which accounted for more than two-thirds of the total greenhouse gases emitted in the atmosphere. The major source of carbon dioxide emissions is the burning fuels to generate electricity (88.4 percent). The second source of CO_2 emission was industrial processes with 11.6 percent of CO_2 emissions in 1990.

Methane—Methane is a strong greenhouse gas with one molecule having 20 times more effect on climate than one molecule of carbon dioxide. The total emission of methane was 1,029 Gg (or 21,609 Gg of CO_2 equivalent) in 1990–91, with agriculture accounting

for more than half the total emissions in 1990–91. Agriculture activities that contribute to methane emissions include enteric fermentation and rice cultivation. The other two sources of methane are wastes, which contributed 26.3 percent, mainly from solid waste disposal on land, and the energy sector, which contributed 20.1 percent of total methane emissions.

Nitrous Oxide—Nitrous Oxide is a potent greenhouse gas with its molecules 300 times more powerful than carbon dioxide at trapping the heat in the atmosphere. The total emissions of nitrous oxide reached 34 Gg or 10,540 Gg of CO_2 equivalent in 1990. Agriculture and fuel burning are the two major sources of emissions, with 61.8 and 35.3 percent of the total NO_2 emissions, respectively.

Updated data on greenhouse emissions is available only for the energy sector and waste sector for year 1999–2000. Since the share of the energy sector was more than two-thirds of the total greenhouse emissions in 1990–91, and the carbon dioxide was the major greenhouse gas, the focus of the analysis on the available data on the energy sector would provide a good indication on the evolution of greenhouse gas emission in Egypt up to 1999–2000.

Table 5 provides data on emissions of carbon dioxide from the fossil energy consumption sector in 1999–2000. The total carbon dioxide emissions from fossil fuel energy consumption reached 102,472 Gg in 1999–2000, which constitutes an increase of 37.3 percent from the total emissions of 74,682 Gg reported for 1990–91. The average annual increase for this 10-year period is 3.7 percent. Around two-thirds of the total carbon dioxide emissions was from petroleum products (70,171 Gg) and one-third from natural gas (32,302 Gg) in 1999–2000.

The major fossil fuel energy consumption sectors contributing to the total carbon dioxide emissions in 1999–2000 include electricity generation, transport, and industry, which contributed to 33, 28, and 24 percent, respectively. The residential/commercial and petroleum sectors contributed 10 and 5 percent, respectively.

Table 5 Emissions of Carbon Dioxide from Fossil Energy Consumption by Sector, 1999–2000 (in 1,000 ton)

Sectors	Petroleum Products	Natural Gas	Total Emissions	Share in the Total
Industry	19,035	5,643	24,678	24
Transport	28,389		28,389	28
Agriculture	309		309	-
Residential /Commercial	9,499	870	10,368	10
Electricity	10,482	23,224	33,706	33
Petroleum	2,458	2,564	5,022	5
Total	70,171	32,302	102,472	

Reference: EEAA report (Energy in Egypt 1999/2000).

Unless actions are taken to increase energy efficiency, substitute cleaner fuels such as natural gas for fuel oil, and hasten the development and adoption of renewable energy technologies, the accumulated burden of carbon dioxide will continue to grow. Just between 1990 and 2000, the carbon dioxide emissions from fossil energy consumption increased by an annual average of 3.7 percent in Egypt. This increase suggest that greenhouse emissions will continue to climb at about the same or higher rate over the next years if current levels of energy use persist. Fossil fuel consumed by vehicles and industry are major sources of the annual increase in greenhouse gases emissions.

Current GOE policies to promote greater energy efficiency and shift to the use of natural gas could curb this trend significantly. EEPP's energy policy of promoting the use of cleaner energy sources and the establishment of energy efficiency codes and standards is expected to have an impact on greenhouse gas emissions. If the policy is effective, we should expect to see a drop or at least a leveling off in the rate of greenhouse gas emissions from transport, industry, and residential/commercial.

The most effective approach in reducing carbon dioxide emissions from the electricity generation sector is to increase the use of renewable natural resources, such as hydropower. However, this alternative is still limited compared to the increase of using natural gas. Increasing the share of natural gas in the electricity sector would certainly contribute to the reduction of carbon dioxide emissions because it produces less CO_2/unit of energy equivalent compared to the fuel oils.

A.4.4 Assess and Promote CNG Buses for Cairo Mass Transit

Reducing mobile source emissions in the Cairo area, particularly from mass transit buses, is a policy objective of EEPP. Emissions from municipal diesel powered buses are one of the major sources of air pollution in Cairo. Shifting to CNG-fueled buses, a cleaner alternative, will contribute to reducing air pollution, particularly in terms of fine particulate matter and hydrocarbon emissions associated with diesel engine operation.

The commercialization of natural gas as a transportation fuel began in Egypt in January 1996. Currently, there are 48 CNG fueling stations—27 of them in Greater Cairo—and 22 vehicle conversion centers operating in the Greater Cairo Area, along the Suez Canal and north to Port Said and Alexandria. More than 37,000 vehicles (about 86 percent of them taxis and privately-owned microbuses used as group taxis and running on regular routes) have been converted to operate on either CNG or gasoline (bi-fuel). Fifty of 5,000 municipal transit buses are fueled with CNG.

Through CAIP, USAID partially funded 50 new CNG-fueled buses in the Governorate of Cairo. One of the objectives of EEPP is to encourage the GOE to take tangible steps towards adopting and implementing a plan to convert to clean fuel power for the bus-fleet in Cairo as evidenced by the purchase (or conversion) of 25 more buses.

Indicator A.4.1 Number of Cairo Municipal Transit Buses using CNG

Indicator A.4.2 Percentage of new CTA Buses Procured that use CNG

To assess effectiveness of the program and to understand the working context, it is important to track not only the number of CNG buses but also total mobile source emissions and more specifically, emissions from buses. These can then be compared with the number of CNG buses in the municipal fleet, and from these it will be possible to calculate the emissions prevented through use of the new buses.

In the short run, the Indicator A.4.1 will be the principal monitoring indicator. The indicator will go from 50 to at least 75 when the planned purchases are made. After that, the issue of interest will be whether the municipal bus authority recognizes that CNG buses are a good idea and purchases more. The best indicator for that will be the percentage of new buses bought that are CNG powered. Ideally this would move from the initial low percentage toward 100 percent, meaning that all new buses would be CNG after some years.

To track this, the MS will follow the total number of CNG buses, the number of new buses purchased, how many of them run on CNG, how many old buses are taken out of service and the size of the fleet.

Table A- 1 Transit Buses in Cairo

Year	1998	1999	2000	2001	2002
Number of buses in fleet	5,000	5,000	5,000	5,000	5,000
New buses (estimated)	250	250	250	250	250
New CNG buses*	5	50			25
Percent new buses CNG	2%	20%			10%
Purchaser of CNG buses		USAID CAIP			GOE CTA

*includes re-fitting, etc as specified in PM and Verification Plan.

Acceleration of the bus-fleet conversion program could have a large impact on reducing air pollution in Cairo. This impact would be evaluated by combining known information about the type of vehicle, the fuel it uses, and the quantity of fuel burned or miles traveled. These data should be developed in the feasibility study to be carried out in Tranche 2.

In 2002, the entire CNG-powered fleet was estimated at 37,000 vehicles, mostly taxis. The MS will also be tracking the use of CNG in the transport sector, which is a PMP indicator in the MS Energy sector. It would be possible to estimate the environmental benefits of converting vehicles to CNG instead of gasoline or diesel by multiplying the number of vehicles times their mileage times their emissions and comparing this to what they would have emitted if they were on the other fuels.

A.4.5 End Lead Smelting in a Major Urban Area and Carry Out Pilot Remediation Activities

Lead emissions in the air has a direct impact on human health. Lead accumulates in the body, in blood, bone, and soft tissue. It is known that exposure to lead levels exceeding air quality standards can cause kidney and heart disease for adults and mental retardation for children. Gasoline fuel-based vehicles and stationary sources from lead smelters were the major sources of lead in the air in Egypt. Leaded gasoline was banned in 1996 and ended use in 1997, so now lead smelters are the primary target for reducing lead.

The specific focus of EEPP work in Tranche 2 is shutting down lead smelting operations in Shoubra el-Kheima and of testing remediation techniques in the area.

Indicator A.4.5.1 Number of Lead Smelting Facilities Decommissioned in Shoubra el-Kheima

The MS will want to show that actions were taken to shut down the smelters and that they were then shut down. The MS should include emission data from the smelters that were closed down as well as showing that the effects of this shutdown are real, and ambient levels of lead having dropped even though they may initially still be well above those of other areas.

If possible, the MS could estimate the health benefits of having shut down the smelters by using statistics on probable sickness, early deaths, etc., had they remained open. The economic benefits could be shown the same way.

There are or were five main smelting facilities in Shoubra el-Kheima in Qualyubia Governorate just north of Cairo. They were producing 60–65 percent of the total production in Egypt. Awad Alla owns three of these smelters and 80–90 percent of total production originates from these smelters. In a few months time, he is planning to move all his facilities to Abu Zabaal, where he has been building a new facility. Officially these smelting facilities have been shut down and the smelting process has moved to the new area provided by the governorate, but actually none of them have started operation in Abu Zabaal and they might be continuing to work illegally.

The smelters were decommissioned in 2001. The MS could try to establish a temporal correlation between decommissioning and reduction of ambient lead concentrations in Shoubra el-Kheima (Indicator A.4.3.2). This will depend on whether they started collecting ambient data far enough before decommissioning to establish a baseline.

The smelters decommissioned in Shoubra el-Kheima appear to be large formal sector activities. The plan is to build new, modern, environmentally sound smelters in another part of the Greater Cairo Area further away from residential areas. However this will probably take some time. There may be a risk that informal sector smelting activities with no environmental controls will crop up in other parts of Cairo to meet demand. In order to know whether this is happening, the MS should have data on the location of formal and informal sector smelting activities across the Greater Cairo, according to the five

types of activity that CAIP is monitoring. Chances are that they don't have this information, but it is worth investigating. This should become a new indicator replacing the current one, if possible.

If a new indicator is possible, then stationary source lead emissions data by location would be ideal, and they will reflect the changing patterns of smelting activity across the region. This would then say whether a decrease in emissions and ambient lead in Shoubra el-Kheima has in fact come at the cost of an increase in emissions and ambient lead elsewhere in the Greater Cairo Area.

The MS does not yet know whether CAIP has such data; however, the MS does know that:

- CAIP has surveyed some plants to estimate emissions coefficients for different activities, and they have then applied those coefficients to estimate emissions elsewhere.
- They conducted the surveys in 1999, but have provided emissions data for 2000 as well. It is not yet known where the 2000 production data came from with which to estimate emissions; however, it suggests that perhaps CAIP is regularly updating production data.
- The fact that they have surveyed plants to estimate emissions coefficients suggests that they could have developed such coefficients for informal sector production as well as for the formal sector.

As of July 2002 there was no decree issued by the Governor of Qualyubia permanently prohibiting lead smelting operations within the boundaries of Shoubra el-Kheima, the operating licenses for all lead smelters have been revoked and thus they have officially ceased operations.

If the MS observes an increase in lead emissions in areas where informal sector activity typically occurs pursuant to the decommissioning, analysis might suggest that illegal lead smelting has moved to those areas. However the ambient data may not be sufficiently reliable with respect to location to make such a conclusion possible. CAIP has not spatialized its point measurements of ambient quality, so the MS will not have a generalized picture of air quality across the city. However, while such a picture might be visually more appealing, it doesn't actually tell us any more than simple observation of increased ambient levels at key points, so it is a loss more for presentation than for substance.

The data indicate that the existing levels of lead in Shoubra el-Kheima were greater than that of Cairo as a whole. Even those of Cairo generally are still greater than international limits and greater than Egyptian standards or limits despite the fact, that ambient lead in Cairo has been dropping over the last 10 years as a result of the government decision to ban leaded gasoline for cars, illustrating that changes in government policy really can achieve something!

Preliminary data from monthly readings from Shoubra el-Kheima from EIMP and CAIP should indicate that ambient levels have gone down since last year. One can expect that the overall numbers will show a decline toward general Cairo levels and this will be shown in the 2002 annual figures.

The MS will not be developing an indicator for the process of coming up with the remediation plans nor for number of sites remediated (according to new guidelines) or something similar. The next monitoring program could consider this if a policy of remediation based on EEPP T2 pilot work becomes a policy measure. The remediation program should have baseline measurements of the lead (and everything else) in the soil to be taken away and they should measure this as the remediation is conducted. MVE should not be trying to come up with these numbers but should indicate to those responsible the interest of the EEPP MS in getting this information.

Indicator A.5.2 Total Stationary Source Lead (Pb) in the Greater Cairo Area

CAIP has developed a lead emissions inventory and database for greater Cairo for years 1999 and 2000. They used the annual production data and emissions factors to calculate the annual emissions from stationary sources. There is a possibility that some of the facility owners under-reported their production out of fear of additional taxation. CAIP obtained some information about the licensed facilities from the General Organization for Industrialization (GOFI), Central Agency for Planning, Mobilization and Statistics (CAPMAS), and an EEAA environmental map of Egypt. There are many unlicensed facilities with no official records.

Estimation of lead emissions would ideally be done based on a detailed survey of the existing pollution sources, to determine the technology used and level of activity. Once emissions coefficients were developed for the relevant plants, emissions estimates could be updated regularly based only accurate reports of level of activity.

In 2000, the total stationary lead emission in Greater Cairo was 1,893 metric tons, which represents a reduction of 29 percent from the total lead emission produced in 1999, as shown in table 6. The major source of stationary lead emissions was secondary lead smelting. In 2000, there were 14 facilities, which contributed 79 percent of the total sources emission in Cairo. *Mazout* (diesel) combustion contributes 20 percent of the total emission. All the other sources, which include lead/acid battery production, secondary copper production, and Portland cement manufacturing, contribute less than 1 percent of the total lead emissions in the greater Cairo.

Table 6 Lead Emissions by Major Sources in Greater Cairo in 2000

Source	Number of Facilities	Production (metric tons)	Lead Emissions (metric tons)	
			Quantity	Percent of Total
Secondary Lead Smelting*	14	36,270	1,504.0	79
Mazout Combustion**		3,304,600	376.7	20
Secondary Copper Processing	33	12,864	6.4	0.3
Lead-Acid Battery Production	206	386,613 (batteries)	3.2	0.2
Portland Cement Manufacturing	3	10,859,420	2.9	0.2
Total			1,893.2	100
Total Lead Emissions in Greater Cairo in 1999 = 2,669 metric tons				

* Production data source: CAIP survey

** Production data Source: Ministry of Petroleum

This reflects the need to control lead emission from the two principal sources, particularly, the need for closing some lead smelting plants. One of the focuses of EEPP related to air quality improvement is to end lead smelting in Shoubra el-Kheima, which is the main contributor to lead emission in Greater Cairo. Closing these facilities will have also a direct impact on reducing the total lead emissions in Greater Cairo.

B. Solid and Hazardous Waste Management

PRINCIPAL PROBLEMS

Inefficient and insufficient collection and disposal of solid waste and cleaning of streets, resulting in accumulation of solid waste, which poses many health hazards, especially for residents of densely populated neighborhoods. Although informal recycling of desirable recyclable material is quite efficient, both collection and final disposal of non-recyclable items is haphazard—usually dumping in remote areas when not left uncollected at all. Proper landfills are needed throughout the country.

Transportation, storage, treatment, recycling, and disposal of hazardous waste (medical, industrial, etc.) is not effectively managed in Egypt with negative impact on the environment and public health.

EEPP TRANCHE 2 POLICY MEASURES

- (Solid Waste) Provide technical assistance to the governorates to establish monitoring and enforcement mechanisms in support of GOE policy to privatize SWM systems
- (Hazardous Waste) GOE implements a hazardous waste management system as required by Law 4.
  - CAAs identify and declare their lists of HW through an official decree
  - EEAA develops and issues guidelines for CAAs to develop their own permit systems of HW handling, processing, treatment, and disposal by the private sector.

PROPOSED EEPP MONITORING SYSTEM INDICATORS

- Number of tons of solid waste generated, collected, disposed, diverted (recycled) and accumulated in EEPP targeted governorates
- Number of tons of solid waste accumulation collected in EEPP targeted governorates
- Number of governorates with at least one new private sector SWM contractor

- Percent of population that feels responsible for clean streets
- Economic efficiency of SWM
- Number of permits issued by CAAs for handling hazardous waste
- Tons of hazardous waste permitted under issued permits
- Tons of hazardous waste disposed of under issued permits

(Note that many indicators do not yet have data or they may have estimates based on population statistics)

B.1 BACKGROUND

Ineffective solid waste management poses a major threat to the environment and to public health in Egypt's cities. The ultimate goal of any action to address solid waste management should be to make Egypt's urban areas free from piles of accumulated solid waste by initiating an efficient solid waste collection, recycling, and disposal system. Reaching this goal may also require that a system be in place for frequent street cleaning, so that any solid waste that is improperly dumped will be removed.

In support of this goal, EEPP is assisting four governorates (Alexandria, Cairo, Giza, and Qalyubia) to privatize solid waste collection and disposal services by providing assistance with design and award of contracts. EEPP also is providing assistance to help them monitor the implementation of the resulting contracts with private providers through establishment of governorate monitoring units that will collect data with which to track the performance of the private contractors and ensure that the solid waste collection problems are being resolved effectively as specified in the contracts.

The underlying assumption is that privatization will improve the quality of service and lead to cleaner streets. Privatization is a declared policy of the Egyptian government and the governorates selected by EEPP are among those targeted by the GOE. A key component in the improvement of solid waste management is improved public awareness of the benefits of cleaner streets and active public participation in reaching that goal. In addition, EEPP is assisting the GOE to make solid waste management regulation consistent with the national solid waste management strategy.

The EEPP monitoring system will show progress toward achieving the program goal, identify constraints impeding progress and suggest additional actions to improve solid waste management in the future.

Virtually no comprehensive accurate data exist on solid waste generation, collection, recycling, or disposal. This is especially the case in rural areas, but even data for urban areas are lacking. What are available are estimates of unknown reliability and applicability, multiplied by population figures. One of the principal activities of the new contract monitoring units being created under EEPP is to systematically gather this type of

information. It is expected that, as these programs come on line, the information—at least in these governorates—will improve significantly.

There is also very little reliable data on hazardous waste, whether production or disposal, primarily because there is no system for these activities. This situation may improve as the EEPP work on disposal permitting comes on line.

B.2 EEPP Policy Measures

1. **Governorates establish monitoring and enforcement mechanisms in support of GOE policy to privatize SWM systems.** Despite the fact that the policy measure focuses on monitoring and enforcement of the privatization process, it presupposes that solid waste management in targeted governorates will be privatized. Therefore, assistance supporting privatization efforts is being provided under EEPP. The indicators for solid waste management, in turn, measure the state of solid waste management, the state of privatization efforts, and the effectiveness of privatization at improving the state of solid waste management.
2. **GOE implements a hazardous waste management system as required by Law 4.** The specific focus of this policy measure, as articulated in the related means of verification is for the CAAs to identify and declare their lists of HW through an official decree; and for the EEAA to develop and issue guidelines for CAAs to develop their own permit systems of HW handling, processing, treatment, and disposal by the private sector.

B.3 Overall Conclusions Based on Indicators

Based on the extremely limited indicator data available it is impossible to determine quantitatively the impact of EEPP policy reforms related to solid waste management. In fact, the only data on collection and disposal now available are derived from estimates made in 1996. However, it is possible to draw general conclusions that:

- Privatization of solid waste management is moving ahead in several governorates
- Collection of urban solid waste is poor and rural solid waste almost non-existent and the problem of accumulation will only worsen with continued population and consumption growth
- Once private contractors are operating, they or the Governorate monitoring units will begin collecting data that should satisfy most or all of the indicators in the EEPP.

Regarding hazardous waste permitting and disposal, given the lack of data, it is only possible to speculate at this time about how the system will function once it is implemented. If the disposal permits are given for the amounts now thought to be

generated and if hazardous waste disposal rises to near the permitted level, this may be interpreted to mean that firms generating hazardous waste are willing to pay a reasonable fee to dispose of it. It may also suggest that the permitted management companies are realizing the anticipated financial returns, so the industry will continue to thrive and grow.

If the volume of hazardous waste disposed is close to but less than the volume for which permits have been issued, the system is working efficiently in terms of knowing how much capacity is needed. If it is significantly lower, it may be that discharging hazardous wastes properly is expensive enough that people are ignoring the permitted disposal facilities and continuing to dispose of hazardous waste illegally. If the two values are the same, either demand has been very accurately predicted, or reporting is being falsified. Another interpretation is that there is still unmet demand for permitted disposal so additional hazardous waste is still being disposed of illegally. Clearly, many interpretations are possible and only actual experience will determine the real story.

B.4 INDICATORS

B.4.1 Background

Because privatization efforts are ongoing, indicators should try to measure pre- and post-privatization conditions to ascertain the effectiveness of privatization (is solid waste being more collected in a more organized way; is it being disposed of in a more environmentally friendly fashion?). In addition, indicators should measure the state of the privatization process (how far along is it in a particular governorate?) and the extent to which private sector contractors are complying with the terms of their contracts with governorates. For simplicity, indicators dealing with solid waste management (SWM) are divided into two categories:

1. Current state of solid waste management, including wastes generated, that collected, and how it is being disposed of, broken into several sections:
   - Household, industrial, and office solid waste generated and collected
   - Street solid waste generated and collected
   - Disposal of solid waste
2. Privatization of SWM.

B.4.2 Household/Industrial/Office Solid Waste Generated/Collected

Indicator B.4.2.1 Total Solid Waste Generated

Knowing how much solid waste is generated by households and businesses is fundamental to the design and evaluation of SWM systems. We may expect this value to increase over time, as a function of increasing population and income (leading to increased consumption of packaged food and other products). Since EEPP does not

include any measures designed to reduce solid waste at the source, such as encouraging reuse or household composting, we do not expect the program to influence the value of this indicator but only the availability of the numbers themselves.

In the absence of data, solid waste generation can be estimated as a function of population and income, using coefficients for how much people at different income levels are likely to throw out. In general, these coefficients in Egypt range from .4 kg/day to 1.3 kg/day per person in urban areas. Changes in population and income can be identified from census data, and would lead to changes in the total solid waste estimates. Changes in buying habits independent of income level would have to be reflected in changes in the coefficients. Consequently, this would be captured by the indicator only if independent data were available with which to determine the extent to which households were shifting to packaged products.

Information about the composition of solid waste would also be useful to consider collecting in the future. These data have implications for both disposal and for recycling prospects. It would be best disaggregated by location smaller than governorate. The only way to collect these data is by some kind of survey. An estimate was made in 1996 but its accuracy is uncertain.[1]

B.4.3 Street Solid Waste Collected or Left to Accumulate

Indicator B.4.3.1 Street Solid Waste Collected

Under the privatization contracts, private contractors will be responsible for street cleaning as well as household solid waste removal. Ideally, street solid waste removal would involve a one-time clean-up, after which all solid waste would be collected regularly and there would be very limited new accumulations in the street. There will always be a need for solid waste bins in the street to hold solid waste generated by people as they move through the city.

One can hope to see high initial levels for this indicator as accumulated solid waste heaps are removed, followed by a steady lower level of collection when the contractor regularly empties bins on the streets. It is hoped that eventually the governorate monitoring units will gather actual data on the quantity of solid waste collected from the streets. However, if private contractors initially collect these figures, data may be easier to obtain.

Indicator B.4.3.2 Volume of Solid Waste Accumulated in the Streets

The ultimate aim of this activity is for the streets to be clean. It is therefore important to monitor the actual quantity of solid waste accumulating in the streets (not in bins for regular collection) to assess whether this goal is being achieved. If this is not being achieved, then even if privatization seems to be working well, additional investigation will be needed to determine where the problem lies. These data will be most useful if they are

[1] This type of data is, or soon will be, collected by the Alexandria Governorate Monitoring Unit.

based on empirical observation. Barring that, they could be estimated based on the other data in the system. However, if this value is estimated rather than observed in the streets, it will measure whether the private collection system has been fully implemented rather than whether it is working effectively.[2]

B.4.4 Disposal of Solid Waste

Indicator B.4.4.1 Solid Waste Disposed of in Landfills, Recycled, or Otherwise Diverted

Solid waste can be disposed of in a landfill, recycled, or burned. Burning is not permitted under the terms of the private concession contracts because of its environmental and public health consequences. It is hoped that much of the solid waste collected will be recycled, and that there will be a profitable market for recycled materials, since this has a wide range of benefits in terms of efficient resource use. A steady increase in the share of solid waste recycled and a decrease in the quantity disposed of in landfills would indicate progress toward that objective.[3]

If the sum of solid waste land-filled and recycled is less than the total amount collected, it will be a sign that additional investigation is needed to determine what is happening to the rest of the solid waste. It is hoped that the governorate monitoring units will collect empirical data for the quantity of solid waste brought to the recycling center, the amount extracted for recycling, and the amount that ultimately is deposited in a landfill. If so, these figures should add up to the total collected. It therefore would be easy to identify any solid waste being diverted elsewhere. It is harder to evaluate the effectiveness of the private contractor's work until data on accumulation are gathered.

In addition, it would be useful to track the total number of landfills in Egypt by location and by capacity. These data could also be divided into sanitary and non-sanitary facilities. These data would show progress toward better managing solid waste if the number of recognized landfills is increasing. Management is further improved as the number of sanitary facilities increases.

Ideally, in the end a table much like that below could be constructed that would show all the major data and indicators together. Comparisons could then be made regarding efficiencies, looking for trends over time.

Table 7 presents currently known and estimated data for solid waste generation and collection. As other data becomes available, it will be possible to monitor the success of these efforts.

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[2] The volume of accumulated solid waste was estimated to be 97 million tons in December 2001. Source: Draft of "The National Environmental Action Plan of Egypt 2002/17" issued in December 2001.

[3] The technical assistance contractor for solid waste management under EEPP suggests that the eventual target for "diversion" is to be 20 percent of generation/collection.

Table 7 Overall Table of Proposed Data and Indicators

Place	Total Solid Waste Generated (estimates)	Private Solid Waste Collection[1]	Solid Waste Disposed in Landfill[1]	Solid Waste Diverted (i.e. recycling)[1]	Street Solid Waste Collected[1]	Street Solid Waste Uncollected
Governorates Targeted by EEPP						
Alexandria	975,000					344,830
Cairo Total	2,979,000					
Cairo South						
Cairo North						
Cairo East						
Cairo West						
Giza	1,036,000					447,050
Qualyubeya	642,000					504,395
Other GOE First Priority Governorates						
Gharbeya	706,000					1,235,000
Menoufeya	483,000					
South Sinai	6,000					512,000
Luxor	36,000					107,022
Aswan	142,000					259,512
Red Sea	21,000					386,351
Fayoum	239,000					
GOE Second Priority Governorates						
Beheira	660,000					
Matrouh	24,000					
New Valley	15,000					
Dakhaleya	947,000					921,820
Port Said	112,000					
Suez	99,000					1,219,550
Sharkeya	706,000					
North Sinai	30,000					
Other Governorates						
Beni Suef	226,000					
Minya	384,000					952,081
Sohag	372,000					
Assiut	353,000					
Qena	289,000					
Ismailia	124,000					
Damietta	158,000					
Kafr el-Sheikh	386,000					

[1]Data for these indicators will not be available until private contractors are operating in these governorates.

Source for estimates: SWM Strategy

Indicator B.4.4.2 Percent of the Population that Feels Responsible for Clean Streets

If Egypt's urban areas are to be cleaned and remain clean in the future, changing citizen attitudes toward public space must complement effective solid waste collection. Even the best solid waste management system, private or otherwise, will not be effective without citizen cooperation. It is critical that the public understand the health, safety, and aesthetic benefits of clean streets. To the extent that this understanding is reflected in a sense of responsibility about keeping the streets clean, it can be measured by a qualitative social survey instrument.

This indicator, which stems from public education work undertaken by EEPP, will show whether there are any changes of attitude occurring with regard to this issue. It would be useful to have the disaggregated numbers by city or governorate to try to correlate with the cleaning and privatization. It also will be useful to disaggregate these data by gender.

B.4.5 Privatization of Solid Waste Management

Indicator B.4.5.1 Number of Governorates with at least One New Private Sector Contractor

If the EEPP privatization work is successful, the demonstration effect may lead other governorates to adopt a similar approach. It is important to note, however, that because privatization of solid waste management is a GOE priority, it may be difficult to disaggregate and quantify the demonstration effect of EEPP assistance from other GOE efforts. For EEPP purposes it therefore will be helpful to track how many private sector contracts are directly or indirectly the result of EEPP assistance.

This indicator defines "new private sector contractors" as those contractors who have signed contracts with a governorate to take over the major portion of solid waste disposal. The prime example of this is Alexandria Governorate, which signed a contract with Onyx Company in 2001. The 2001 MVE Baseline study, "Status of Private Sector Participation in Solid Waste Management in Egypt," showed that virtually every governorate had some private sector participation in solid waste management but the majority of these were small contracts for small areas and for limited services. Table 8 shows the number of planned and actual private sector contracts by year. Table 9 shows the privatization situation in Spring 2002.

Table 8 Number of Governorates with at Least One New Private Sector Contractor

Results	Baseline Year 1999	2000	2001	2002	2003
Planned		1	1	2	3
Actual	0	1	2	4	

Table 9 Situation in Privatization of SWM, Spring 2002

Governorate	Current Situation
Cairo	Has been split into 4 sectors: north, south, east, and west. Contracts have been awarded in the north to AMA (Italian company) + Arab Contractors (Egyptian), in the east to FCC (Spanish), in the west to Urbaser (Spanish), while the contract for the south area is presently out for bid.
Giza	Has been split into 3 sectors: city, districts, and villages. For the city, a contract was awarded to FCC, and the other two areas have not yet been awarded.
Alexandria	Contracted to CEGA ONYX (French), and they started working.
Damietta	They are debating with a German company to manufacture coal from solid waste.
Sharqia	El Zigzag awarded the contract to Arab Contractors (Egyptian).
Gharbia	Science and Technology Association will collect hazardous waste.
Beheira	Bid conditions and description notes were written.
Qualyubeya	A draft of the conditions has been written.
Dakhaleya	A tender was held but it has not been awarded yet.
Fayoum	Three population centers—Abu Shy, Snores, and Tamyea — are working with EcoConServ Company (Egyptian) under a DANIDA funded contract for 3 years. Also looking at privatization.
Aswan	GTZ, the German technical cooperation agency, is implementing a pilot program of solid waste management system, that ensures solid waste collection, transport, safe disposal, and recycling within the City of Aswan, in partnership with Aswan Governorate.
Qena	The governorate is collecting their own garbage.
Suez	A contract was let in February 2002 to Tanthefkou Company, a joint venture between Egypt, Saudi Arabia, and Britain.
Assiut	Although the governorate asked companies to present their offers in April 2002, no contract has been awarded.
Beni Suef	There are cities and villages with SWM funded by FINNIDA. Construction of a landfill, to be completed by October 2003, is presently out for tender.
Minya	Working with the Italian technical cooperation agency on institutional strengthening and identifying wastes for a pilot project.

Source: EEAA and EEAA Solid Waste Management Group minutes of May 2002.

Indicator B.4.5.2 Solid Waste Collected by Private Contractors in Each Governorate

As stated earlier, the assumption is that private sector management of solid waste will dramatically improve collection and disposal effectiveness. However, until the new system is implemented it is not clear that: (a) private contractors will be efficient enough to deal with all the solid waste generated; or (b) the contracts will be structured properly to handle all the solid waste generated (will the contract price be adequate to ensure that

the contractor can profitably do the job?). These questions will only be answered once the system is implemented.

The private contractor is expected to collect all of the solid waste generated in their service area. Therefore, comparing data collected for this indicator with data collected for the indicator "total solid waste generated" will provide an initial assessment of whether the contractor is meeting its obligation. If the amount collected by the private contractor is more than the original estimate (and collection does not include accumulated waste), the data show that the original estimate was incorrect. This information itself is useful. The governorate monitoring units should be able to collect and provide data on the actual amount of solid waste collected by the private contractors. The value of this indicator will presumably rise until it approaches 100 percent of solid waste generated at which point it will only rise when other variables change, such as the number of households served, amount of solid waste generated per capita, or the size of the service area. Table 10 illustrates both collection efficiency and total solid waste collected.

Table 10 Estimated Collection Efficiencies of Selected Governorates of Public Sector Services

Governorate	Governorate Collection Efficiency	Quantity Collected Annually (in 1000 tons)
Cairo	0.625	1,861.8
Giza	0.64	663.4
Qualyubeya	0.5	321.0
Alexandria	0.77	750.8
Gharbeya	0.5	352.8
South Sinai	0.333	2.0
Luxor	0.45	16.4
Aswan	0.41	37.3
Red Sea	0.525	9.0

Sources: Collection efficiencies from "Solid Waste Management Strategy," Table 2.2, p. 25-26, quoting Urgent Plan, Interministerial Committee for Solid Waste Management, Technical Secretariat, 1999. Quantities collected calculated based on collection efficiencies and total (rural plus urban) trash generation. Total collection efficiency calculated based on total quantity collected divided by total (rural plus urban) trash generated.

Indicator B.4.5.3 Economic Efficiency of Privatized SWM (future indicator)

The choice of EEPP activities in the solid waste management arena is based on a belief that privatization will be the most cost-effective way to achieve the ultimate goal of clean streets. While other indicators, particularly accumulation of solid waste in the streets, measure progress toward the ultimate goal, this indicator addresses the intermediate objective because it directly measures whether privatization has been an effective tool.

Measuring this indicator is difficult because there are several variables that might affect results. However, an assessment of the cost per unit of solid waste collected will shed at

least some light on the issue. If this figure goes down with the new privatized system, then we clearly have a win–win solution. That is, the streets will be cleaner and at a lower cost per unit. Unfortunately, if this figure goes up it will be more difficult to interpret the results. It could mean that private services are less efficient than the previous system. However, if the streets are clean, albeit at a higher unit cost, it may mean that the old system was ineffective simply because it costs more to do a good job. Despite possible uncertainty in the interpretation of this indicator, it would be useful information to have. Even if we cannot fully compare the public and private systems, knowing the actual unit costs of solid waste collection in Egypt will be invaluable information for other cities considering privatization of solid waste management.

B.4.5 Hazardous Waste Management

Beyond the conventional solid waste problem, hazardous wastes also create problems for Egypt's environment and the health of its citizens. While there is no comprehensive inventory of hazardous wastes produced in Egypt, the magnitude of the problem can be estimated based on data for collection of medical and industrial waste (both contain substantial concentrations of hazard waste) in Alexandria.

- Medical Waste: approximately 25,000 tons per year
- Industrial Waste: approximately 100,000-150,000 ton per year.

EEAA is addressing the need to establish a hazardous waste management system under EEPP. There are already many initiatives led by EEAA that together comprise the first building blocks of an integrated system of hazardous waste management. A national hazardous waste list was completed in 1999, based on the Basel Convention for the Transboundary Movement of Hazardous Wastes. Guidelines for the hazardous wastes classification/characterization and coding criteria are being developed by EEAA and the guidelines for treatment, recycling, and disposal of the hazardous waste will be issued by EEAA to be used by all CAAs. EEAA currently is also developing Egyptian standard coefficients that can be used to estimate the quantities of hazardous wastes generated, given knowledge of output and production technology.

Other initiatives and experimental work also preceded current activities. EEAA, supported by DANIDA, conducted a feasibility study for "Industrial Hazardous Waste Management in Greater Cairo," and launched a project, supported by FINNIDA, for integrated management of industrial hazardous waste in Alexandria. In 1999, EEAA initiated a 3-year demonstration project to establish a hazardous waste landfill in Alexandria with the support of FINNIDA. Switzerland is currently cooperating with Egypt regarding hazardous waste management and an Egyptian "Hazardous Substances Information and Management System" is being developed.

The Executive Regulations for Law 4/1994 prohibit handling hazardous waste without a license from the competent authority responsible for the waste. The distinction between the handler and the generator in the law indicates that its intent is not to license

generators, but rather to license those operations that handle the waste after it leaves the generator, i.e., transporters and operators of treatment, storage, and disposal facilities (TSDFs).

The competent authorities are identified as:

- Ministry of Agriculture for agricultural wastes
- Ministry of Industry for industrial wastes
- Ministry of Health for pharmaceutical, laboratory, and domestic insecticides
- Ministry of Petroleum for petroleum wastes
- Atomic Energy Authority in the Ministry of Electricity for wastes emitting ionized radiation
- Ministry of Interior for inflammable and explosive wastes.

Under the revised (or new) systems, the CAAs responsible for different types of wastes will issue permits to private sector entities—or others—to operate environmentally safe facilities or processes to handle HW.

The aforementioned administrative guidelines will be based upon the requirements of Law 4/1994, the experiences of the United States, the European Union, India, and Malaysia in managing hazardous waste permitting systems, and the existing status of permitting systems in the six CAAs identified in the Executive Regulations for law as being responsible for issuing hazardous waste licenses.

Regarding the first focal issue, ministerial decrees from two of the CAAs (the Ministry of Health and of Interior Affairs) have been issued their lists of hazardous wastes. With respect to other ministries (Agriculture, Electricity, Industry, and Petroleum), they will be using the Basel Convention system until their decrees are issued. Their lists of hazardous wastes have been prepared, reviewed by EEAA and Ministry of Health and they are pending adoption through issuance of Ministerial Decrees.

Disposal of hazardous waste is at present a significant and totally uncontrolled problem in Egypt. Information about transportation, processing, treatment and disposal is important in order to track whether these wastes are being handled properly, identify polluted areas, and enforce Law 4/1994. Monitoring HW quantities, types, characteristics, spatial distribution, flows of recycling and disposal, etc., is a critical component in an HWM system. Improving system efficiency and overall effectiveness is dependent on such monitoring. Indicators have been selected consistent with the overall framework and EEPP focus. These include:

- Number of permits issued by CAAs for handling HW
- Tons of HW permitted under issued permits
- Tons of HW actually disposed of under issued permits

As the permit system is implemented, the monitoring system will track how many permits have been issued, for which kinds of waste, and in what quantities—probably in

a format similar to that shown in table 11. It would also be useful to compare waste permitted for disposal with waste actually disposed. Information about the final disposal of hazardous substances is important both to plan for disposal and to plan for possible health or environmental disasters related to accidental releases.

In the near term, before data is available for the selected indicators, obtaining other information as a proxy will be useful to get some idea of the situation regarding HWM. Information on population, production technologies, and medical facilities (and relevant coefficients) is needed.

Table 11 Summary of Hazardous Waste Management Statistics

Results	Baseline Year	200X	200X	200X	200X
Number of Permits Issued by CAAs for Handling of HW					
Tons of HW Permitted under Issued Permits					
Tons of HW Disposed of Under Issued Permits					

Indicator B.4.5.1 Number of Permits Issued by CAAs for Handling of HW

The data source will mainly be the CAAs that issue the permit. No data are currently available as the permit systems are still being developed. Exceptions are the already existing systems, which will be revised according to EEAA guidelines, of the ministries of Health, Electricity, and Interior. No data are currently available on the permits of these already existing systems.

A steady increase in permitted waste handling capacity is an objective in this area. Therefore, the number of permits issued increasing is a reasonable indication that hazardous waste is being managed more systematically. Such a result may be interpreted to mean that the permitting system works and permitted firms believe that hazardous waste management offers them a viable commercial opportunity.

Indicator B.4.5.2 Tons of HW Permitted under Issued Permits

The data source will mainly be the CAAs that issue the permit. No data are currently available as the permit systems are still being developed.

Indicator B.4.5.3 Tons of HW Disposed of Under Issued Permits

The data source would mainly be the CAAs that issue the permits. The licensing authority is responsible for monitoring the performance of the licensee to ensure that the licensee is in compliance with stipulated conditions. Ensuring compliance requires

enforcement—recording hazardous waste disposed and conducting on-site inspections of permitted facilities. Disposal facility records could be a secondary source of data.

There are no data relevant to the indicator as the permit system is still under development. Generally (beyond permitting), there are no data available at the national level. However, sporadic and one time data sets may be available for some locales based on individual initiatives, such as new industrial cities. In Alexandria, the estimated 25,000 tons per year of medical wastes to be collected from hospitals and clinics will be treated in a Medical Waste Treatment Center at the sanitary landfill site following completion of construction work and inception of facility operation. Recording of tonnage, volume, and types will be conducted for amounts received, processed/treated and disposed by facility management (the contractor) and monitored by Alexandria governorate. Hazardous industrial waste, estimated as 100,000–150,000 tons/year currently is often disposed along with general industrial waste. Establishing a special unit for hazardous industrial wastes within the Alexandria Governorate new sanitary landfill in the Borg al-Arab area is still being considered.

C. Energy Management

PRINCIPAL PROBLEMS

Reliance on relatively high-polluting fossil fuels, much of which has to be imported, to meet energy demand in Egypt. As a solution, the GOE is working to promote the substitution of less polluting domestic natural gas for imported fossil fuels.

EEPP TRANCHE 2 POLICY MEASURES

- Promotion of natural gas use in the industrial and commercial sectors through assistance to local distribution companies (LDCs).
- Support for private sector energy efficiency activities and energy efficiency certification

PROPOSED EEPP MONITORING SYSTEM INDICATORS

- Energy production by source
- Energy consumption
- Rate of natural gas and CNG consumption
- Level of public awareness regarding energy efficiency
- Number of EESBA member energy efficiency services companies

C.1 BACKGROUND

The energy sector is crucial both for national development and for environmental protection. On the development side, energy is a key input for virtually all economic activity. Ensuring that energy supply is not a bottleneck to economic growth, by guaranteeing an affordable supply and by improving energy efficiency and reducing demand, is crucial for development in any country. On the environment side, fuel combustion to produce energy is a major source of both local and global air pollution, which in turn leads to public health problems. Strategies to reduce both local air pollution and greenhouse gas emissions often rely heavily on reducing emissions from

fuel combustion by improving energy efficiency, shifting to less polluting fuels, and encouraging activities that conserve fuel (e.g. substituting public transit for private cars).

Egypt's economy depends largely on the use of liquid fuel oils derived from petroleum for its energy consumption. The combustion of fuel oils in industry and transportation constitute the main source of air pollution in Egypt, producing a high level of particulate matter, increasing health risks. It further generates pollutants that contribute to greenhouse gases such as sulfur dioxide, nitrogen oxide, and carbon dioxide.

Proven natural gas reserves have increased significantly in Egypt in the last few years, making natural gas a reliable and clean energy resource for domestic usage. At the end of 2000, proven reserves of natural gas resources reached about 9 billion barrels of oil equivalent (BBOE), which represent more than half the amount of crude oil reserves. The GOE energy policy calls for shifting local energy demand from petroleum products to natural gas. In Tranche 1, EEPP supported the GOE's effort to implement this policy through the development of a National Energy Efficiency Strategy (NEES). This strategy aims to reduce air pollution and emission of greenhouse gases by promoting a reduction in the inefficient use of fossil fuels.

The data on energy are generally very good, at least with regard to the usual production and consumption by sectors and by fuel. These give an overall picture of the energy sector. EEPP's work—concentrated on promoting the use of natural gas and compressed natural gas—has been supported by good data as well.

C.2 EEPP Policy Measures

EEPP is currently focusing its policy reform initiatives on achieving policy objectives that accomplish the goals of the NEES. The Tranche 2 policy measure for this area is:
Policies and market initiatives in place to expand domestic natural gas use.

In addition, EEPP is providing technical assistance to promote energy efficiency management companies.

C.2.1 Analysis by Sector

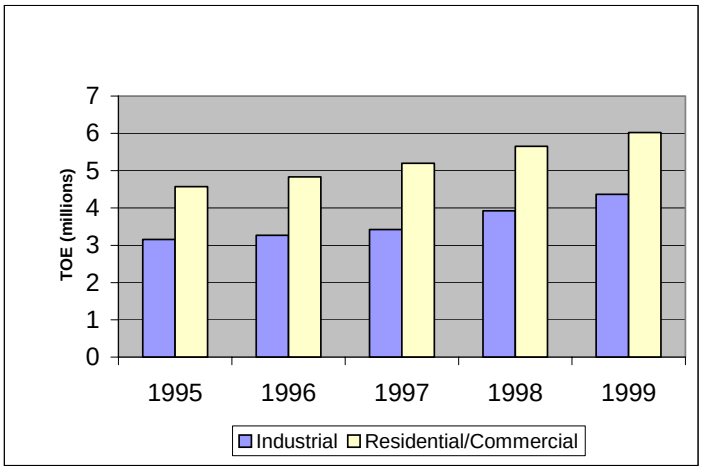
Industrial and Residential/Commercial Sectors

Through the efforts of LDCs that do the actual marketing and distribution of natural gas to customers, use of natural gas in the industrial and commercial sectors has risen in recent years. In fact, the share of natural gas in overall energy consumption is presently more than one-third and the rate of increase is increasing each year.

A report in September 2002 said that over the last 2 years local demand for gas had grown by approximately 70 percent. Going forward, this rapid growth is expected to continue, with recent estimates indicating an average annual increase in gas demand of more than 5 percent during the next decade. (Nexant info from Gas and Energy Co.

(Genco-Group or GENCO), Natural Gas Demand Assessment. 2002.) Figure 1 illustrates the history of increasing use of natural gas.

Figure 1 Industrial and Residential/Commercial Natural Gas Consumption



Current natural gas demand projections indicate that the amount of gas that LDCs deliver to local end-users will more than double by 2006–07. (Nexant Sept 2002)

It is possible to calculate the beneficial effects of using CNG instead of fossil fuels as it lowers the volume of various pollutants emitted by burning fossil fuels. As one example, table 12 provides emission factors for CO_2.

Table 12 Calculating Emissions Reduction

Fuel Type	Metric Tons CO_2 per Metric Ton of Fuel
LPG	2.9837
Gasoline	3.1046
Kerosene	3.2160
Gas Oil	3.2093
Diesel	3.2093
Fuel	3.1094
Natural Gas	2.6115

Source: Intergovernmental Panel on Climate Change, 1996.

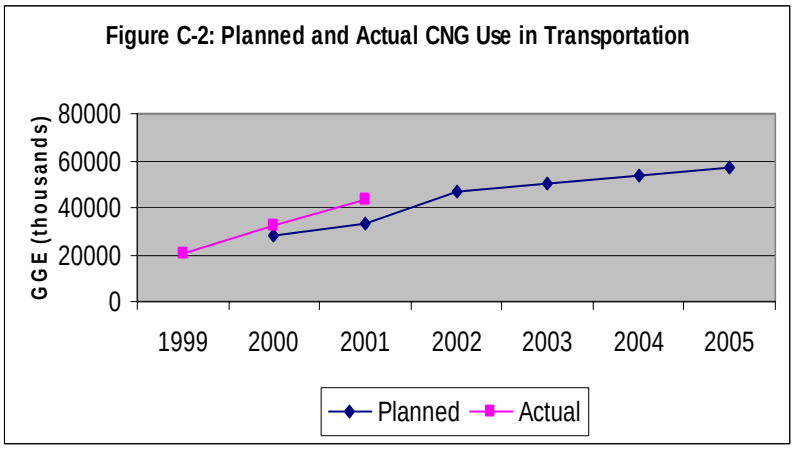
Thus, in one year, by using one mt of natural gas instead of one mt diesel, Egypt emitted .2256 fewer mt of CO_2. Since Egypt used about 15.7 million TOE of natural gas in 1999/2000 it saved the emission of 1.8 million mt of CO_2.

Transport Sector

Vehicle emissions are a major source of urban air pollution. Shifting to cleaner alternative fuels such as CNG is an important indicator for better management of the environment. The indicator focuses largely on Cairo which, in 1999, comprised almost 100 percent of the market for CNG and contained the majority of Egypt's motor vehicles.

In Tranche 2, EEPP has worked to promote the use of natural gas in vehicles. Likewise, CAIP has been doing this since 1997. As can be seen in figure 2, the actual use of CNG in transport has been higher and growing faster than planned.

Figure 2 Planned and Actual CNG Use in Transportation

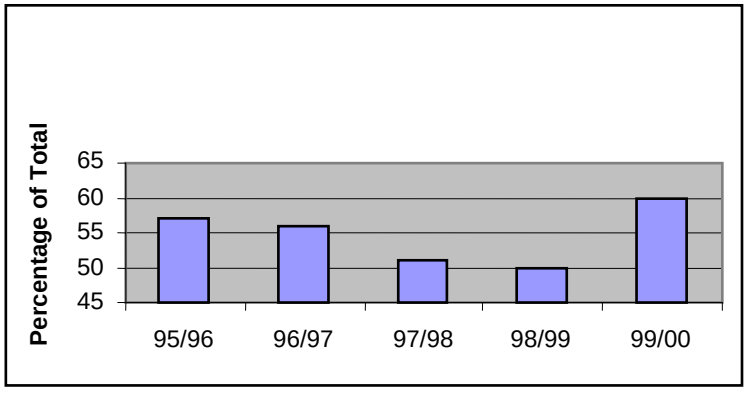


Electricity Generation Sector

Natural gas is now the major energy source used for electricity generation having reached 60 percent in 1999–2000. The two other principal energy sources include petroleum products (20 percent) and hydro (20 percent).

Figure 3 shows that, prior to 1999 the share of natural gas as a part of total energy used in electricity generation had decreased from 57 percent in 1995–96 to 50 percent in 1998–99. However, in 1999–2000, an increase of 10 percent from the previous year was observed. This could be due to the corresponding shift in the government's policy to emphasize increased use of natural gas in the production of electricity.

Figure 3 Electricity Generation Fueled by Natural Gas



As there is very little potential to expand hydropower in Egypt, increased generation to meet expected increased demand for electricity will have to come from: (a) other renewable energy sources; (b) fossil fuels; or (c) natural gas. At present, other renewable energy sources, such as wind and solar account for less than one percent of generation capacity and cannot be expected to grow to meet demand. Thus, the GOE has taken a policy decision that future increases in electricity demand will be met through

increased use of natural gas. Therefore, generation capacity using natural gas as its fuel source will continue to increase as a percentage of total installed capacity. The annual increase in the share of natural gas in electricity generation is a good indicator for measuring the impact of this policy shift (Indicator C.4.4.3). Given the GOE's policy that all new generation capacity be fueled by natural gas, data for the 2003 monitoring report should reflect this commitment.

C.2.2 EEPP Reforms in Energy Services

EEPP is working with the GOE to implement the recommendations of the NEES by promoting energy services companies that provide energy efficiency services to other companies. The Energy Efficiency Services Business Association (EESBA) is the association of these companies and was formed through the result of the EEPP work in Tranche 1. From 1999 to 2001, the number of firms has increased from 9 to 15.

Additionally, EEPP is providing technical assistance in order to set up a program to certify energy efficiency engineers in Egypt. At present, there are no completed certifications, but the EEPP MS will follow the growth of these over the next years, and will be able to report on the program development and on its effects in 2003.

C.3 Overall Conclusions Based on Indicators

Given the importance of the energy sector and the GOE's emphasis on promoting use of domestic natural gas, there is a relatively large volume of data available for the indicators selected for the monitoring system. It is likely that this data set will continue to increase in size and depth in future years. Determining the impact of the EEPP policy measure that promotes energy efficiency by improving the market for energy efficiency companies is being measured by counting the total number of firms each year. The data through 2001 show that the number of firms has increased and is equal to the number planned. In future years, it might make sense also to include an indicator that measures total revenue or total net profits for the energy efficiency services sector.

With respect to natural gas, two general conclusions are clear about the sector: energy demand is increasing in Egypt, and cleaner natural gas is being substituted for high polluting fossil fuel.

However, the fact that the energy sector, and promotion of natural gas in particular, are high priorities for the GOE makes it difficult to disaggregate the impact of EEPP assistance from other GOE actions. EEPP assistance specifically focuses on supporting LDCs. Therefore, indicators should be added to the monitoring system that measures the impact of EEPP assistance on the volume of natural gas sold by LDCs. In order to determine the impact of EEPP assistance, this indicator would compare sales of LDCs that receive assistance from EEPP from those that do not.

C.4 INDICATORS

C.4.1 Background

The following indicators were selected to provide information useful for evaluating the impact of the GOE's policy programs of switching from liquid fuel oils to natural gas. They are also of particular interest for evaluating the impact of implementing the EEPP policy on the promotion of natural gas use and improvement of energy efficiency.

Most of the data for the measurement of energy indicators is collected from annual Organization for Energy Planning (OEP) reports. OEP is a key agency responsible for integrated energy planning and policy formulation within the Ministry of Electricity. OEP is also the main agency responsible for collecting and analyzing energy data at the national level.

C.4.2 Energy Production

Indicator C.4.2.1 Total Primary Energy Production by Energy Source

The analysis of total primary energy production includes petroleum products, natural gas, hydropower, and other direct energy sources. It does not include electricity, which is an intermediary energy produced by one of the primary energy sources. This analysis is an important indicator to assist in developing policy to encourage the shift of local energy consumption from more polluting liquid fuel oils to cleaner-burning natural gas.

Egypt's primary energy production reached 59.690 million TOE in 1999–2000, with an annual increase of 1.3 percent from the previous year (1998–99), as shown in table 12.

Table 13 Primary Energy Production (million TOE)

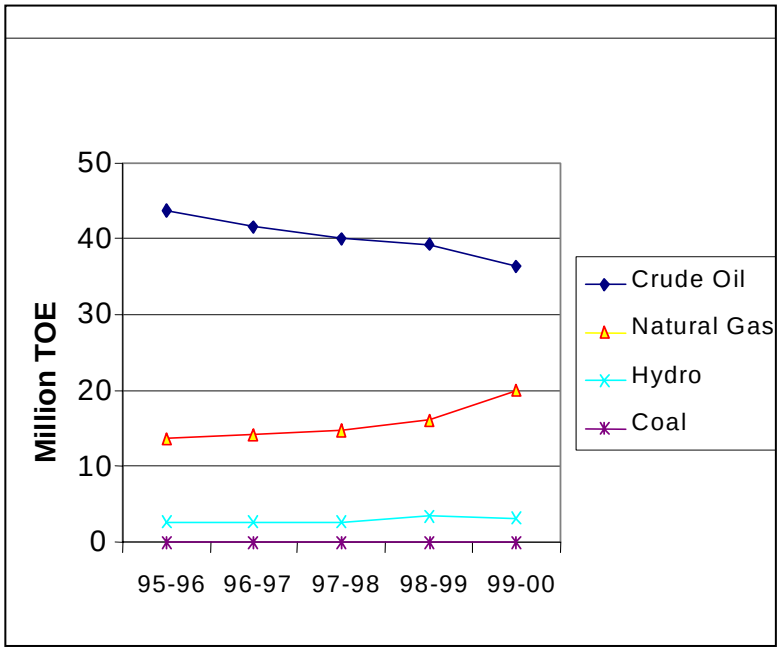
Resource	Year					Percent of Total Production
	1995–96	1996–97	1997–98	1998–99	1999–00	
Crude Oil	43.773	41.573	40.091	39.318	36.402	61.0
Annual Change		(5.03%)	(3.56%)	(1.93%)	(7.42%)	
Natural Gas	13.789	14.289	14.757	16.164	20.022	33.5
Annual Change		3.63%	3.28%	9.53%	23.87%	
Hydropower	2.554	2.632	2.681	3.365	3.240	5.4
Coal	-	0.062	0.067	0.067	0.026	0.04
Total Production	60.117	58.556	57.597	58.914	59.690	100
Annual Increase		(2.6%)	(1.6%)	2.3%	1.3%	

Source: Energy balance tables in "Energy in Egypt," editions from 1995–96 through 1999–2000 issued by the Organization for Energy Planning (OEP).

Crude Oil: Crude oil continues to be the most important energy source produced in Egypt. The country produced 36.403 million TOE in 1999–2000, accounting for 61 percent of total energy production. Crude oil production decreased continually from 43.773 million TOE in 1995–96 to 36.402 million TOE in 1999–2000, with the highest annual decrease of 7.42 percent occurring in 1999–2000.

Natural Gas: Natural gas production reached 22.022 million TOE in 1999–2000, which accounted for 33.5 percent of total primary energy production. Domestic energy production from natural gas has shown a steady increase since 1995–96, with the highest annual increase of 23.87 percent occurring in 1999–2000. Egypt's current annual consumption of natural gas is approximately 24.5 billion m^3 (21.5 million ton of oil equivalent), which represents about 45 percent of the country's total primary energy consumption. Based on current demand projections, natural gas' share of total primary energy consumption will exceed 55 percent by 2005–06. (Nexant information from 2002 GENCO data and extrapolation of data from OEP's *Energy in Egypt* (1999–2000).) The increasingly dominant role of gas highlights that the manner in which natural gas is used in the future will be a deciding factor in Egypt's ability to achieve sustainable economic development.

Figure 4 Primary Energy Production



Hydropower: Hydropower production in 1999–2000 was 3.240 million TOE, which represents 5.4 percent of total energy production. Most of this energy was produced by the Aswan Reservoir, High Dam, and the Esna Hydropower Station.

Coal: Coal production in Egypt is low, just 0.026 million TOE in 1999–2000, which represents only 0.04 percent of total energy production.

If the trend toward decreased crude oil production continues and the trend toward increased natural gas production continues, natural gas production will equal crude oil, with natural gas being substituted for crude oil. Increased availability of natural gas energy in the local market would facilitate the implementation of the policy to shift from fuel oil consumption to natural gas in many sectors. The impact of this policy will be measured using the natural gas consumption indicators developed below.

Indicator C.4.2.2 Electrical Power Generated from Renewable Natural Resources

Many renewable energy resources, including wind, sun, and water, are important sources of energy for two main reasons. First, unlike petroleum or natural gas, they can be used without depleting the source that supplies them. Second, they are non-polluting energy sources. Most of them do have other environmental impacts, of course; wind power creates noise and consumes land, and hydroelectric dams radically alter aquatic ecosystems. These impacts must be considered; however, they generally are less polluting than emissions and other impacts from fossil fuel sources.

The electrical power generated from all renewable natural resources was 1.262 million TOE in 2000, which accounted for 1/5 of its total energy sources. However, at present Egypt's only significant source of renewable energy is hydropower, which comes from the dams on the Nile. In 2000, the first wind power source came online, but this is not a significant source at present. In the future, there is interest in using agricultural wastes, particularly animal waste and the bagasse that is a residual of sugar cane processing, as a power source. If prices were competitive, solar power also could offer considerable potential, given the climate.

The share of hydropower and wind in electricity generation is shown in table14.

Table 14 Sources of Energy for Generating Electricity (production in million TOE)

Year	Thermal	Hydro	Wind	Total	Share of Renewable Energy
1996	3.690	0.994	—	4.684	21.22%
1997	3.929	1.032	—	4.961	20.80%
1998	4.409	1.051	—	5.460	19.25%
1999	4.531	1.316	—	5.847	22.51%
2000	5.041	1.260	0.002	6.303	20.02%

Source: Energy balance flow charts published in Organization for Energy Planning, *Energy in Egypt*, editions for 1995–96, 1996–97, 1997–98, 1998–99, and 1999–2000.

Hydropower is essentially fixed in supply at present, whereas non-renewable energy sources such as petroleum and natural gas are not. Other renewable energy sources are insignificant at present and not likely to increase substantially in the near future. As the economy grows, energy demand will rise. If current GOE and EEPP policy initiatives are effective, the percentage of energy demand met by natural gas will increase.

However, with the cost of renewable energy continuing to decline and with the continued support of renewable energy programs, there may be an increase in the amount of renewable energy used for generating electricity the near future.

C.4.3 Energy Consumption

Indicator C.4.3.1 Total Primary Energy Consumption by Energy Source[4]

Different sources of energy release different quantities of pollution, so the choice of fuel can be significant to environmental protection. Also, inefficient use of energy resources poses a significant threat to the environment. One of the objectives of EEPP is to develop policies that result in use of cleaner energy sources and contribute to improved energy efficiency. Tracking total energy consumption by energy source would be helpful in the analysis of trends in the use of each energy source, and therefore, in evaluating the impact of EEPP and the GOE's energy policy.

Total Energy Consumption: Total primary energy consumption reached 44.054 million TOE in 1999–2000. The total primary consumption in Egypt was only 35.84 million TOE in 1995–96, which represents a growth rate of 22.9 percent during the period from 1995–96 to 1999–2000. The annual increase from 1998–99 to 1999–2000 was 4.4 percent. The main sources of energy included crude oil, natural gas, and hydro. Table 15 tracks primary energy consumption by source of that energy since 1995–96.

Table 15 Primary Energy Consumption by Source of Energy (Million TOE)

Energy Source	Year				
	1995–96	1996–97	1997–98	1998–99	1999–2000
Crude Oil	21.079	21.751	24.454	25.099	24.517
Share in Total Consumption	58.8%	59.3%	61.2%	59.5%	55.6%
Natural Gas	11.2	11.47	11.684	12.799	15.704
Share in Total Consumption	31.2%	31.3%	29.2%	30.3%	35.6%
Hydro	2.554	2.632	2.681	3.365	3.24
Share in Total Consumption	7.1%	7.2%	6.7%	8.0%	7.3%
Coal	1.011	0.836	1.13	0.926	0.594
Share in Total Consumption	2.8%	2.3%	2.8%	2.2%	1.3%
Total Consumption	35.844	36.689	39.949	42.189	44.054
		2.3%	8.9%	5.6%	4.4%

Reference: "Energy in Egypt," editions from 1995–96 through 1999–2000 issued by the Organization for Energy Planning (OEP).

[4] Primary energy consumption is the amount of energy directly used by consumers and producers, in the form of petroleum products, natural gas, and other energy sources. It does not include consumption of electricity, which is an intermediary energy source generated by one of the primary energy source.

Crude Oil Consumption: Egypt's primary energy consumption is still dominated by the use of crude oil. Egypt used 24.517 million TOE of crude oil in 1999–2000, which accounted for more than half the total primary energy consumption (55.6 percent). However, the crude oil portion of total consumption has been declining, with a drop of 3.2 percent since the beginning of the reporting period (dropping from 58.8 percent in 1995–96 to 55.6 percent in 1999–2000). This decrease is probably due to the decrease in crude oil production and the adoption of a policy to switch to natural gas.

Natural Gas Consumption: The consumption of natural gas reached 15.704 million TOE in 1999–2000, which accounted for more than one-third of the total primary energy consumption. It is interesting to note that the share of natural gas in the primary energy consumption increased from 31.2 percent in 1995–96 to 35.6 percent in 1999–2000, with the highest increase reached in 1999–2000. This increase is mainly attributed to the adoption of a policy of switching the energy consumption to more natural gas and less crude oil. Nexant reports that current daily consumption of gas is roughly 2.6 billion cubic meters (or annual consumption of natural gas is approximately 24.5 billion cubic meters equaling 21.5 million TOE), which represents about 45 percent of total primary energy consumption in Egypt. Based on current gas demand projections, natural gas' share of the country's total primary energy consumption will exceed 55 percent by 2005–2006. (Nexant information from 2002 GENCO data and extrapolation of data from OEP's *Energy in Egypt, 1999–2000*.)

Hydro Energy Consumption: The consumption of hydro energy was 3.24 million TOE in 1999–2000, which accounted for 7.3 percent of the total primary energy consumption in Egypt. The consumption of hydropower stayed almost the same during the period from 1995–96 to 1999–2000, because the supply of this source of energy did not change (no new hydropower stations).

Indicator C.4.3.2 Final Energy Consumption by End-use Sector[5]

Energy consumption by sector is a useful indicator if one is interested in the management of energy consumption and resulting air pollution from the demand side. Energy policies that operate through demand management—for example, by increasing gasoline taxes or implementing preferred pricing schemes for natural gas equipment—will be designed to change final consumption. Information about the total primary energy consumption by sector is essential information for developing policies to encourage the shift of local energy consumption to cleaner energy sources such as natural gas and renewable natural resources. The data would provide information about who the major consumers of energy are, and how that is changing over time.

Egypt's final energy consumption by end-users reached 30.848 million TOE in 1999–2000, which increased by 4.4 percent from the total consumption of the previous year.

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[5] Final energy demand is the amount of energy directly used by consumers and producers, in the form of petroleum products, natural gas, electricity, and other energy sources.

The end user sectors of energy are grouped into five categories: Industry, Transportation, Households/Commercial, Government/Public Utilities, and Agriculture.

Table 16 shows the final energy consumption by end-users sectors from 1995–96 to 1999–2000.

Table 16 Final Energy Consumption by end-user sectors (in million TOE)*****

Sector	1995/96	1996/97	1997/98	1998/99	1999/2000
Industry **	12.825	12.75	13.782	13.743	14.016
Share in Total Final Energy Consumption	50.0%	49.9%	48.8%	46.5%	45.4%
Transportation	7.345	7.576	8.236	9.113	9.654
Share in Total Final Energy Consumption	28.6%	29.0%	29.1%	30.8%	31.3%
Household and Commercial	4.573	4.833	5.202	5.652	6.024
Share in Total Final Energy Consumption	17.8%	18.5%	18.4%	19.1%	19.5%
Government / Public Utilities	0.587	0.608	0.713	0.714	0.825
Share in Total Final Energy Consumption	2.3%	2.3%	2.5%	2.4%	2.7%
Agriculture	0.304	0.309	0.317	0.320	0.329
Share in Total Final Energy Consumption	1.2%	1.2%	1.1%	1.1%	1.1%
Total	25.634	26.076	28.250	29.542	30.848
Annual Increase		4.0%	4.1%	4.6%	4.4%

* Data Includes petroleum products and natural gas for non-energy use

** Includes Coal

Industry: Industry is the major consumer of energy with a total consumption reaching 14.016 million TOE in 1999–2000, which accounted for almost half of total energy consumption. Although industry continued to increase its energy consumption, its share of total energy consumption was lower because other sectors increased their consumption faster.

Transportation: Total energy consumption by the transportation sector is 9.694 million TOE, which accounted for less than one-third of total energy consumption in Egypt in 1999–2000. The transportation sector's share of total energy consumption increased from 28.6 percent in 1995–96 to 31.3 percent in 1999–2000. Energy consumed consists mainly of petroleum products used to power cars, trucks, and buses, which are also major contributors to air pollution, particularly in Cairo.

Household/Commercial: This sector is the third major consumer of energy, with energy consumption reaching 6.04 million TOE in 1999–2000, which accounted for about one-fifth of total energy consumption. The share of energy consumption increased from 17.8 percent in 1995–96 to 19.5 percent in 1999–2000.

Government/Public Utilities: Total energy consumption was 0.825 million TOE in 1999–2000, which represented only 2.7 percent of total energy consumption.

Agriculture: As a sector, agriculture uses the smallest share of energy consumption in Egypt. It consumed 0.329 million TOE in 1999–2000 (or 1.1 percent of total energy consumption).

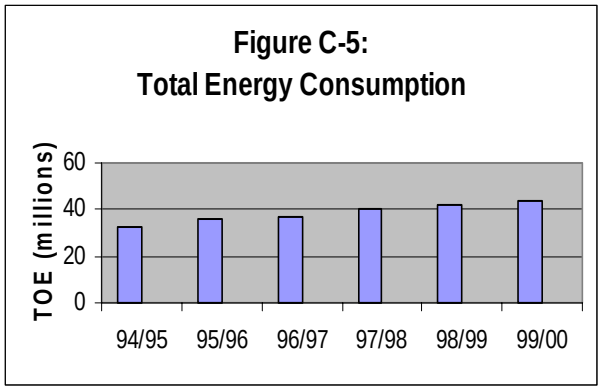
The transportation sector and the household/commercial sector are the two sectors likely to show the greatest expansion in the future, as they track economic growth of the country. In addition to the industry sector, improving energy efficiency and encouraging the shift to use cleaner energy sources such as natural gas in the transportation and household/commercial sectors would have a significant impact on reducing pollution and emission of greenhouse gases. One of the policy objectives of EEPP is to support the GOE in expanding the use of CNG in the municipal bus fleet in Cairo. The impact of this policy is part of a specific indicator described elsewhere.

C.4.4 Natural Gas/Compressed Natural Gas

Indicator C.4.4.1 Natural Gas Consumption as Percent of Total Energy Consumption

Energy consumption still depends mainly on crude oil, even though the natural gas reserves are more than double the reserves of crude oil. Total energy consumption is illustrated in figure 5.

Figure 5 Total Energy Consumption



Natural gas is preferable to other energy sources because it is cheaper, generates less "local" pollution (non-GHG), and generates less GHG emissions. The current energy strategy of the GOE supports the shift from fuel oil consumption to natural gas in many sectors. Increasing the share of natural gas in energy consumption is also one of the main objectives of EEPP. The Egyptian Gas Petroleum Corporation (EGPC) is required under this policy objective to adopt a strategic plan that outlines policies and market initiatives (e.g. investment credits, facilitating natural gas payments, equipment rebates, and preferred pricing schemes) to encourage the expanded domestic use of natural gas. Analyzing the change in the percentage that natural gas represents of total energy consumption is an important tool for evaluating the impact of the natural gas promotion policy.

Domestic energy consumption increased by 36.2 percent during the 1994–2000 period, increasing from 32.332 million TOE in 1994–95 to 44.054 million TOE in 1999–2000, as illustrated in table 17. Likewise, natural gas consumption increased by 46.3 percent during the same period, increasing from 10.734 million TOE in 1994–95 to 15.704 million TOE in 1999–2000. The share of natural gas in the total energy consumption

fluctuated between 29.2 percent and 35.6 percent, with the highest share in 1999–2000. Continued increases in the natural gas share in the total energy consumption would indicate success of the policy of promoting the use of cleaner energy gas in general. With the GOE's continuing support for implementing this policy, it is expected that consumption of natural gas will continue to increase over the next 10 years, with demand met by domestic supplies.

In fact, Nexant reports (Sept 2002) that current daily consumption of gas is roughly 2.6 billion m^3, which represents about 45 percent of total primary energy consumption in Egypt. Based on current gas demand projections, natural gas' share of the country's total primary energy consumption will exceed 55 percent by 2005–06.

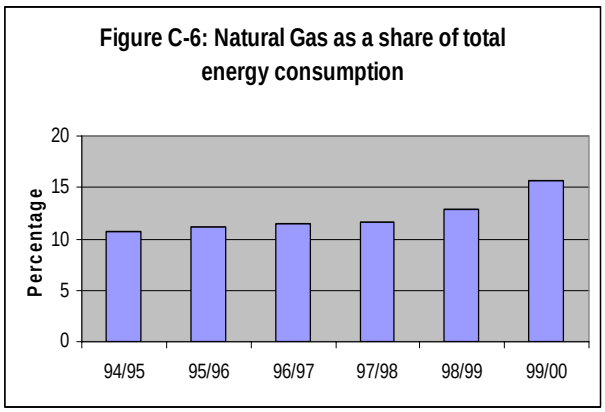
Table 17 Share of Natural Gas in Total Primary Energy Consumption (Million TOE)

	1994–95	1995–96	1996–97	1997–98	1998–99	1999–2000	Percent Change 1994–2000
Total Energy Consumption	32.332	35.844	36.689	39.949	42.189	44.054	36.2
Natural Gas Amount	10.734	11.200	11.470	11.684	12.799	15.704	46.3
Natural Gas Share	33.2%	31.2%	31.3%	29.2%	30.3%	35.6%	

Source: OEP annual reports

Indicator C.4.4.2 Natural Gas Consumption by End-use Sector

Figure 6 Natural Gas as a Share of Total Energy Consumption



Tracking natural gas as a share of total energy consumption by end-use sector will help identify the sectors of the economy that are more readily converting to natural gas. Sectoral data will also show which sectors now use the most energy, suggesting where it may be productive to develop additional incentives for natural gas conversion.

One can expect to see a significant increase in the share of natural gas in total energy consumption in targeted sectors in the near future after the adoption and implementation of this policy. One might hope to see a link between increases in this share and decreases in ambient pollution or emissions of "local" pollutants, especially in areas where there are continuous air quality monitoring systems, such as the one in Cairo. Table 18 shows natural gas consumption by end-use sector.

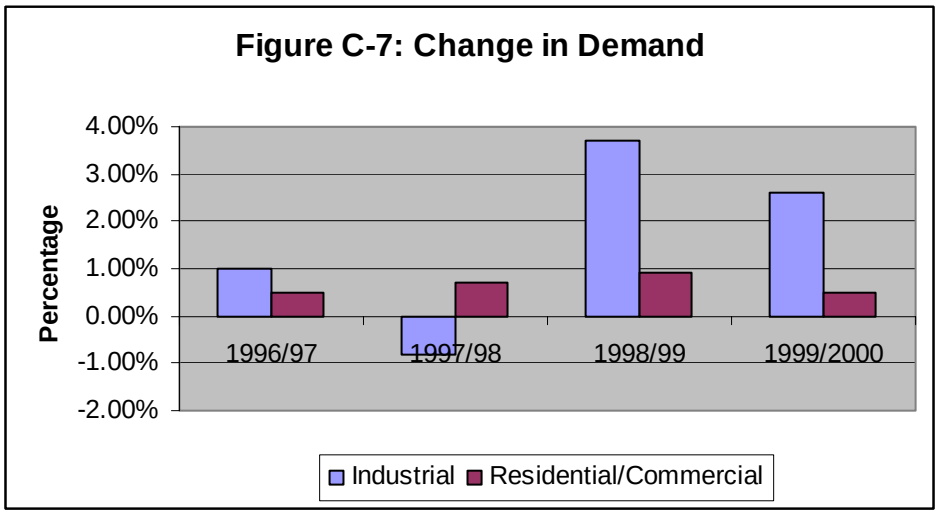
Table 18 Natural Gas Consumption by End-use Sector*

End Use Sector	Year	1995–96	1996–97	1997–98	1998–99	1999–2000
Industry	Total Energy Consumption	12.825	12.75	13.782	13.743	14.016
	Natural Gas Consumption	3.153	3.266	3.420	3.923	4.363
	Gas Share	24.6%	25.6%	24. 8%	28.5%	31.1%
	Percent Change		1.0	(0.8)	3.7	2.6
Residential/ Commercial	Total Energy Consumption	4.573	4.833	5.202	5.652	6.024
	Natural Gas Consumption	0.161	0.191	0.247	0.319	0.37
	Gas Share	3.5%	4.0%	4.7%	5.6%	6.1%
	Percent Change		0.5	0.7	0.9	0.5

* Industry and Residential/Commercial sectors were the only sectors for which data on natural gas consumption was provided in the 1999–2000 OEP report. No natural gas consumption was reported for the transportation sector or any other end use sectors.

Reference: Energy balance tables from "Energy in Egypt," editions from 1995–96 through 1999–2000 issued by the Organization for Energy Planning (OEP).

Figure 7 Change in Demand



Industry: Egypt devoted 14 million TOE to the industrial sector in 1999–2000, which is almost one-half of its total end-use energy. The industrial sector also used the largest amount of natural gas as a percentage of total energy consumption. The natural gas share increased from 24.6 percent in 1995–96 to 31.1 percent in 1999–2000. The largest annual increases in the share of natural gas in the industrial sector occurred during the period from 1997–98 to 1999–2000, with annual increases of 3.7 and 2.6 percent respectively. This increase in the share of natural gas in the future is expected to continue over the

period after 2000 as a result of the new energy policy of encouraging the use of natural gas.

Residential/Commercial: This sector used 6 million TOE of total energy in 1999–2000, which accounted for one-fifth of Egypt's end-use energy consumption. During the same year, the natural gas consumption reached 0.37 million TOE, which represents 6.1 percent of total end-use energy consumption.

The share of natural gas in the total end-use energy consumption is still very low in residential/commercial compared to the potential for using natural gas in this sector. The deployment of cost-effective natural gas-based energy systems in residential/commercial buildings, as is encouraged by the policy objective of EEPP, would boost the consumption of natural gas in this sector. Therefore, the annual increase in the share of natural gas in the total energy will be a good indicator of the success of the new energy policy of shifting to natural gas in this sector. However, it may take several years before the real impact is felt at the national level. The development of the process for incorporating natural gas energy systems in this sector needs to address several technical and financial barriers before it is implemented on a large scale. A pilot area or sub-sector where EEPP might focus its activities might be more appropriate for measuring the short-term impact of this policy in the residential/commercial sector.

Indicator C.4.4.3 Natural Gas Consumption for Generating Electricity

Petroleum products remain the primary source of energy for generating electricity, and electricity is the primary source of energy consumption in residential, commercial, government, and public buildings. The sources of energy for producing electricity include natural gas, petroleum, and hydro-power. Egypt has been implementing a policy of shifting from petroleum products to natural gas in its electricity generation to produce energy to meet the demands of all sectors in an economically efficient, environmentally sound manner. A continued increase in the share of natural gas in the total energy consumption for generating electricity would be a good indicator for measuring the success of this policy in the electricity sector.

Natural gas is the major energy source for electricity generation. The share of natural gas in the total energy consumption for electricity generation reached 60.3 percent in 1999–2000. The two other energy sources include petroleum products (20 percent) and hydro (19.7 percent).

Table 19 shows that the share of natural gas in total energy used in electricity generation was continually decreasing before 1999. It decreased from 57.2 percent in 1995–96 to 49.9 percent in 1998–99, a decrease of 7.3 percent in 4 years. In 1999–2000, an increase of 10.1 percent over the previous year was observed. This could be explained by the shift in the policy of using more natural gas in the production of electricity.

Table 19 Share of Natural Gas in Total Energy Consumption for Electricity Generation

	1995–96	1996–97	1997–98	1998–99	1999–00
Total Energy Consumption for Electricity (Million TOE)	12.287	12.986	14.117	15.389	16.392
Natural Gas Consumption for Electricity (Million TOE)	7.023	7.314	7.228	7.675	9.880
Natural Gas Share in Total Energy Consumption for Electricity	57.2%	56.3%	51.2%	49.9%	60.3%

Reference: Organization for Energy Planning (OEP) reports from 1995–96 through 1999–2000.

Nexant reports that two of the Local Distribution Companies' (LDCs) biggest customer groups will be the electric power sector and the petrochemical industry. The electric power sector currently accounts for about 62 percent of Egypt's total gas use and this share is expected to increase over time with the planned development of new gas-fired power plants. (Nexant info from EGAS, 2002) Large demands on gas will also come from Egypt's emerging petrochemical industry which will be a major area for new investment and a generator of exports and foreign currency earnings.

An annual increase in the share of natural gas in electricity generation is a good indicator for measuring the impact of the policy of shifting to natural gas consumption for electricity generation. It is expected that the share of natural gas in electricity generation will continue to increase in the future as a result of the GOE policy to promote the use of natural gas to replace petroleum products.

Indicator C.4.4.4 Volume of CNG Sold for Transportation

Vehicle emissions are a major source of urban air pollution. Shifting to cleaner alternative fuels such as CNG is an important indicator of improved environmental management. This indicator focuses largely on Cairo which, in 1999, comprised almost 100 percent of the market for CNG for motor vehicles. Key assumptions required to see improvement in the indicator are: (1) the GOE continues to promote use of CNG; (2) alternative sources of financing are found to sustain increased use of CNG; and (3) suitable cost structures continue to enable CNG companies to be profitable.

If the total volume continues to go up over time, it will suggest that CNG-powered transportation is increasing, which is a desirable outcome. If it decreases, obviously additional policy initiatives will be necessary. In either case, it will be difficult to determine whether EEPP interventions have had a significant impact on CNG-powered transportation, given the relatively modest level of assistance and the potential for other factors to influence the sector.

Table 20 Volume of CNG Sold for Transportation (1,000 GGE)

	Baseline Year 1999	2000	2001	2002	2003	2004	2005
Planned		28,300	33,100	46,666	49,933	53,429	57,169
Actual	20,200	32,753	43,614				

The total annual volume of CNG sold to the Egyptian transportation sector (public and private buses, cars, and trucks) is measured here in 1,000 gallons of gasoline equivalent (GGE). CNG sales in Egypt are typically measured in cubic meters. One cubic meter of CNG is equivalent to 1 liter of gasoline, and is therefore equal to 0.264 GGE in energy content.

Discussions with CNG firms indicates that targets should be calculated based on a 7 percent increase in sales rather than the previous assumption of eight new refueling stations online every year, with each station selling about 350,000 m^3 per month fully loaded (i.e. 92,460 GGE). Targets were adjusted accordingly beginning with 2002.

Indicator C.4.4.5 Increase in Natural Gas Use in Governorates where EEPP is Working

MVE recommends constructing an indicator based on governorate-level statistics on natural gas use so that comparisons could be made for those governorates in which EEPP-assisted LDCs are working versus those where EEPP is not.

Indicator C.4.4.6 Increase in Natural Gas Sales by Local Distribution Companies with which EEPP is Working vs other LDCs

MVE suggests comparing the LDCs that EEPP is working with to those with which it isn't working. The objective would be to say that the assisted LDCs grew at 10 percent per annum while the non-assisted grew at 5 percent, or something similar.

LDCs are playing a major role in the development of Egypt's gas industry. Going forward, all sales of natural gas to end-users will be made by LDCs. Nexant reports (Sept 2002) that over the last 2 years, local demand for gas has grown by approximately 70 percent. Going forward, this rapid growth is expected to continue, with recent estimates indicating an average annual increase in gas demand of more than 5 percent during the next decade. Current natural gas demand projections indicate that the amount of gas that LDCs deliver to local end-users will more than double by 2006–07. (Nexant info from GENCO, Natural Gas Demand Assessment. 2002)

4.5 Public Awareness and Private Sector Participation in Energy Efficiency

Indicator C.4.5.1 Percent of Respondents who are Aware of Energy Efficiency

Energy efficiency is not a concept that is widely understood by the public. People generally make decisions about energy use based on their lowest perceived cost. However, lowest cost to the user may not reflect highest efficiency for society (i.e. if the price of a given fuel is subsidized). In other cases, the public may be unaware of the inefficiency of certain energy use decisions. Therefore, using a qualitative survey instrument to measure public awareness about basic principles of energy efficiency is a reasonable means of assessing the impact of EEPP public outreach efforts in this area.

Although this is a qualitative indicator, if the survey instrument used to measure the indicator is properly designed and implemented, it should provide a rough measurement of the effectiveness of EEPP interventions that focus of improving public awareness. At this point, no survey data is available for this indicator. Once survey data are made available, it will be possible to disaggregate them by gender, as well as other variables.

Indicator C.4.5.2 Number of Private or Quasi-private Sector Companies Providing Energy Efficiency Services

If the number of companies providing such energy services increases, it should indicate that demand is increasing for these services because firms recognize the cost savings possible through improved efficiency. If the information is available, it might be useful to quantify the size of energy efficiency firms by revenue in order to better understand the size of the market. The indicator measures the cumulative increase in the number of private sector energy service providers who are market participants either as new firms or as existing firms (outside the market) with new energy efficiency products or services.

The change in number of private companies entering the energy efficiency market as providers of products and services is an indicator of not only the interest and confidence of those companies, but also the possible investment funds that lenders are likely to make available to this market. Egypt's National Energy Efficiency Strategy will focus on using public/private partnerships to reach the strategy objectives that will create incentives to private companies to consider entering into this market.

The source of data will be the annual achievement report of the Egyptian Energy Services Business Association (EESBA) produced at the end of each calendar year, which states the cumulative number of members for each year. Data will be verified with the information available from UNDP–GEF and other published market reports to ensure accuracy.

Table 21 Number of Member Firms in EESBA

	Baseline Year 1999	2000	2001	2002	2003	2004	2005
Planned		12	15	16	18	20	20
Actual	9	13	15	18			

Growth is slower in later years to reflect the focus on engaging larger firms who have a broader clientele range to enter the market rather than simply increasing number of firms per se.

D. Water Resources Management

PRINCIPAL PROBLEMS

National security and economic development in Egypt are fundamentally dependent on effective water resources management. Population pressure and pollution are threatening the availability of water resources to meet the country's needs.

EEPP TRANCHE 2 POLICY MEASURES

EEPP does not presently include any policy objectives or policy measures that directly address water resources management. However, water sector programming, which currently is being implemented through other USAID projects (with the Ministry of Water Resources and Irrigation or other agencies as the GOE counterparts) will be part of the next environmental program. And technical assistance for certain water-related activities is already beginning in the supplemental period of Tranche 2.

PROPOSED EEPP MONITORING SYSTEM INDICATORS

- Consumption of surface and ground water by sector
- Water use per unit of output by sector
- Real value of aggregate agricultural production per 1,000 m^3 of Nile water used in agriculture
- Number of irrigated feddans where water delivery is managed by a participatory process.

D.1 BACKGROUND

Population growth and ambitious plans for economic and social development are causing increasing disequilibrium between demand and supply of a very limited resource. With the current population about 66 million, the annual population growth rate at 2 percent, and a stagnant national water supply of 55 billion m^3 per year, it is expected that water scarcity will be an important problem in the future. This scarcity will have significant

negative impact on the environmental and economic sectors and therefore, more effective water resources management is critical. . The per capita share of water resources passed below the threshold of the UN water poverty line of 1,000 m^3 at the beginning of the 1990s and is further dwindling with population growth. It now equals approximately 830 m^3.

Effective water resources management includes consideration of factors specific to water resources and water usage in Egypt. Of significance in this regard is water allocation to different sectors versus the economic returns of such allocations. The agriculture sector, for example, represents only 16 percent of the national gross domestic product (GDP); however, it consumes about 85 percent of water resources. At the same time, the average product value per 1,000 m^3 of water of the industrial sector reaches about 200 times the corresponding value of the agricultural sector.

Effective water resources management is not limited to optimized resource allocation between competitive sectoral demands. It extends to rationalization of resource use at the individual sectoral level through technological transformations and other economic means that relate actual cost to actual use. Egyptian agricultural water consuming practices and relatively high public costs relate to deeply entrenched traditions and culture that were developed during centuries of water abundance and central planning.

Because water is what makes Egypt possible, data for water for irrigation and other uses can be excellent. They are also historically comparable. The difficulty is related to the purpose for which the data are to be used: agricultural data on production and value may not present an accurate picture.

D.2 EEPP Policy Measures

There are no policy measures in EEPP (Tranche 1 or 2) that directly address water resources management. However, three of the policy objectives in Tranche 1 indirectly related to water resources management. These included:

1. **Build capacity of EEAA to provide long term strategic planning and environmental policy formulation and analysis.** Activities of this objective were related to updating the NEAP, which included a component on water resources management.
2. **Integrate the environmental dimension in national planning and development programs.** This objective generally calls for more effective interaction between the environmental and water resources management sector.
3. **Decentralize core environmental management functions to regional, governorate, and local levels.** This objective indirectly implies more decentralization of water resources management.

D.3 Overall Conclusions Based on Indicators

Because water resources management in Egypt has been viewed principally as an agricultural issue, available data focus on that sector. Much of that data can be used directly (or in some case, indirectly) to measure environmental conditions and the effectiveness of environmental management efforts. Whether under EEPP or its planned follow-on program, once objectives and policy measures are developed that specifically target environmental management, additional indicators must be identified that measure their effectiveness.

In the meantime, it is clear from the data available that water use is increasing in absolute terms. While initiatives to conserve water resources through efforts focused on reuse and formation of participatory management schemes are increasing, water scarcity is also increasing. In addition, urban water resources management is becoming a greater concern as the GOE continues to promote the establishment and expansion of new towns in desert areas with extremely limited local water resources.

D.4 Indicators

D.4.1 Background

Water resource management strategies in Egypt are focused on three major objectives:

- Increase the supply of water through such means as better capture of rainfall and flash flood waters, more use of groundwater, negotiating a larger share of the Nile's waters from Sudan and Ethiopia and other Nile basin countries, or desalination.
- Increase the recycling of the water already available, by using it more than once before it flows into the Mediterranean. This could involve such practices as reuse of agricultural water or treating industrial and sewage effluent so that the outflow can be reused directly.
- Reduce final demand, through pricing or changes in technology.

Selecting indicators to monitor the status and effectiveness of water resources management at the national level entails examining a wide scope of data and information needs that surpasses the limited and specific purpose of EEPP monitoring system. The monitoring system will be limited to key issues of resource allocation between competitive sectoral demands versus their economic returns. This is addressed through two indicators:

- Consumption of surface and ground water by sector
- Water use per unit of output by sector.

Secondly, monitoring optimization of water used by individual sectors is limited to the agricultural sector because this is the major consuming sector. Two indicators will measure management of agricultural water use:

- Value of agricultural production per 1,000 m^3 of water used
- Number of irrigated feddans where water delivery is managed through a participatory process.

It will be necessary to develop additional indicators for the system in the future to monitor a wider range of water resources management issues (i.e. water pollution). Indicators in this area should focus mainly on pollution levels and the effectiveness of efforts to reduce pollution levels. Because pollution is a critical limiting factor of resource use—in addition to its negative impact on population and ecosystems—both pollution levels and pollution reduction provide a very sensitive measure of the effectiveness of water resources management. Proxy indicators also could be used to determine pollution levels or the effectiveness of pollution reduction policies, such as annual consumption of fertilizers and pesticides per hectare of agricultural land or percent of untreated municipal and industrial wastes. Another possible future indicator might be: Percent or amount of untreated municipal and industrial wastes discharged into the water supply.

Indicators measuring water reuse also should be considered. Reuse of drained irrigation water is a significant issue in Egypt. Mixing agricultural drainage water with fresh water for irrigation has become a clear policy to meet water shortfalls, especially in new frontier reclamation schemes such as North Sinai (Al-Salam Canal). However, reuse of municipal wastewater in restricted agro-production (especially for inedible crops such as agro-forestry) is also a valid option as this industry uses 2.50 billion m^3 of water per year.

D.4.2 Water Consumption

Indicator D.4.2.1 Consumption of Surface and Groundwater by Sector

Consumptive use is water that cannot be reused by someone else downstream. It is therefore the final element in the allocation of water resources among users and is a fundamental input into any analysis of water management. The goal of any water management policy is presumably to use all available water, so eventually consumptive use should be 100 percent of available water (assuming, of course, some minimum considered unavailable because it is needed to protect aquatic ecosystems). Water may be used more than once. If most municipal and industrial use is non-consumptive, it may be reused later by agriculture, which does consume most of what it accesses. Even within agriculture, water may be used several times before it is eventually consumed, as it may run off one field providing some nutrients and then move onto another.

The NEAP 1996 Nile River Basin water balance provides data on consumptive use by major user groups as shown in table 22. Calculation methods are not currently available. Data indicate that agriculture is overwhelmingly the largest user of water in the country, accounting for 83 percent of water withdrawals from the Nile, and 97 percent of

consumptive use. This expanded use reflect the economic policies of trying to maintain the current percent of domestically produced food supply versus food imports, and thus a certain level of self-sufficiency. It also reflects the social dimension in the economic policy that provides support to the sector that accommodates the largest percent of poor population.

Table 22 Extraction/Consumptive Use of Nile River Basin Water (billions m^3/year)

Water Consumption	Extraction and Return of Water	Sectoral Shares in Extraction	Sectoral Shares in Consumptive Use
Municipal Extraction	4.54	6.24%	
Return to river – treated	0.7		
Return to river – untreated	2.93		
Consumption	0.91 (20%)		2.16%
Industrial Extraction	7.53	10.34%	
Return to river	7.08		
Consumption	0.45 (6%)		1.07%
Agricultural Extraction	60.73	83.42%	
Return to river	19.91		
Consumption (evapo-transpiration)	40.82 (67%)		96.78%
Total Extraction	72.8	100.00%	100.00%
Total Consumptive Use	42.18 (58%)		

Source: NEAP 1996 Nile River Basin Water Balance, p. 17.

However, these data do not provide information about whether the water that is "consumed" is actually used by the plants or has evaporated off the fields, rather than being absorbed by plants, and thus "consumed" without contributing to plant growth. This is an inefficient use of water that relates to many factors, but mainly to the traditional technology of "flooding" irrigation. This information might be identified and monitored in order to contribute to current policies of decreasing water use per unit of production through expanding the alternative technologies of sprinkler and drip irrigation to maximize returns on the available resource.

Indicator D.4.2.2 Water Use per Unit of Output by Sector

This indicator looks at the efficiency of water use in agriculture and other sectors. Within each sector, decreases in water use per unit of output over time would indicate increased efficiency of water use within the sector. At the level of a specific product, water use could be measured per physical unit of output. However, because non-homogeneous products cannot be summed, for many purposes, it is more meaningful to measure water use per unit of value of output. Time series data on the average product of water within each sector will show whether the sector is becoming more efficient in its water use.

Available sector-level data on consumption of water are the same as those shown in table 22, above. Since they are for 1996, they are compared with 1996 GDP data to obtain the average product of water.

Comparison across sectors within a time period highlights that the economic contribution of water allocated to industry is much greater than that of water allocated to agriculture. Concerns about water use in agriculture could center on the contribution of the sector to GDP, to employment, or to food self-sufficiency. The sector accounts for less than 20 percent of GDP (CAPMAS p. 267) but employs some 37 percent of the labor force (EPIQ p. 26). Direct estimates of food self-sufficiency are not readily available, but in 1999 the value of imported food products was almost 10 times that of exports (CAPMAS, pp. 275, 277), suggesting a significant shortfall in domestic agricultural production relative to demand. It appears that employment might be the driving concern in the design of Egyptian agricultural and water allocation policies. This is also reflected in the strategy of agricultural expansion, as a way to ensure employment opportunities for an unskilled labor force expected to grow dramatically in the next 20 years.

Adjusting water allocation from agriculture to industry to increase the overall return of the resource has inherent feasibility problems due to the social implications of the chosen economic policy. Though this is not the only factor in production, reallocation of water to industry on the scale required to equalize the return in the two sectors would entail huge social disruption, since a large percent of the Egyptian labor force is in the agricultural sector and larger percent of poor population are in rural areas.

In this regard, and considering the information revealed by the cross-sectional comparisons, monitoring the slow and incremental change through time series data could provide valuable information on economic and social changes taking place.

If conservation efforts were in place, one would expect to see the amount of water used drop within sectors over time. One might also see shifts in relative levels of use across sectors, if it was easier for some to conserve than for others. In the absence of any significant conservation efforts, however, one should not expect to see changes. It is important to bear in mind that comparisons across sectors in a given time period are not particularly meaningful, except perhaps to suggest where it might be most effective to seek reductions. Table 23 sheds light on the relative value of water in various sectors.

Table 23 Average Product of Water

Sector	Consumptive Use in billions of m^3	Contribution to GDP	Average product in \$ per 1000 $meters^3$
Industry	0.45	\$18,941,069	\$42.09
Agriculture	40.82	\$9,741,710	\$0.24

Sources: Consumptive use from water balance, NEAP p. 17. 1996 GDP data from World Bank 2001 Indicators CD.

D.4.3 Agricultural Water Management

Indicator D.4.3.1 Real Value of Aggregate Agricultural Production per 1,000 m^3 of Nile Water Used in Agriculture

Here the value of aggregate production in agriculture in a given calendar year is the monetary value of crops produced in that year, in constant Egyptian pounds. Also, to control for changes in prices, aggregate production in every year is based on the average prices for the 1994–96 period.

For the purposes of this indicator, production is defined as including 23 major crops, which are:

barley	long berseem	short berseem	broadbean (fava)	chickpea
fenugreek	flax	garlic	lentil	lupine
sugar beet	wheat	groundnut	maize	onion
Rice	sesame	sorghum	soybean	cotton
sugar cane	potato	tomato		

Aggregate production is also defined only for the old lands since new lands still suffer complications in collecting reliable production data in a timely and consistent fashion. The old lands are, roughly, the agricultural lands in the Nile River Valley and Delta. In terms of governorates—the basic unit of aggregation for national agricultural statistics—the old lands are defined as the governorates of Behera, Gharbia, Kafr el-Sheikh, Dakahlia, Damietta, Sharkia, Menoufia, and Qualubeya in Lower Egypt; Giza, Beni Suef, Fayoum, and Minia in Middle Egypt; and Assuit, Sohag, Qena, and Aswan in Upper Egypt.

The quantity of Nile water used in agriculture is measured in 1,000 m^3 of water. The quantity of Nile water available to agriculture in a given year is estimated as the quantity of water released from the High Dam minus evaporation losses, plus groundwater used in agriculture, minus municipal and industrial withdrawals, and water released to the sea. These estimates are then cross-checked against estimates based on the area planted in different crops and the water requirements of those crops.

The indicator is a proxy for the efficiency of water use in agriculture. Other factors that influence the estimated value of the indicator include changes in the mix of crops grown, changes in the productivity of other inputs, and errors in data.

Data on the quantity of water used in agriculture is obtained from the MWRI Annual Water Budget Sheet. Estimates of aggregate production are obtained from the Ministry of Agriculture and Land Reclamation (MALR) Annual Agricultural Statistics. Agricultural and water use data is collected for the cropping year from October to September. It is reported and available one agricultural year later. A recent report by the MVE unit of the Agricultural Policy Reform Program (APRP) suggests that the data (primarily yield data) used to estimate aggregate production is biased upward. The effect of these data

problems on aggregate production is likely small and should not affect the trend in the indicator. USAID continues to analyze and document this process each year.

The MALR collects annual data on the area planted in different crops, the yield per area, and market prices. Aggregate production equals the sum over the 23 crops of area × yield × price (constant 1994–96). Indicator value (in a given year) is the aggregate value of production in that year divided by the quantity of Nile water used in agriculture in that year.

The reported value of agricultural production is limited to the 23 major crops cultivated on areas classified as 'old lands.' It does not consist of the total aggregate agricultural production for the country. The data for the volume of water used in agriculture, however, is the total volume of Nile water used for all crop production on all lands. This affects the accuracy of the results to some extent but if the same definitions are used each year, does not affect its consistency. Data on the quantity of water used is given in table 24.

Table 24 Quantity of Nile Water used for Irrigated Agriculture (1,000 m^3)

	Baseline Year 1997–98	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04
Planned		549	562	579	600	625	645
Actual	535	551	559	553	586.9		

Source: USAID Performance Monitoring Plan

Year 2001 data (shown above) misses the target by a small amount. There are many sources of uncertainty (mentioned above) in the calculation, which may lead to figures both above and below the target. Calculating the amount of Nile water actually used for agricultural production requires accurate data on the amount of water drained through the system and released. However, the general trend should show a 3 percent increase from year to year.

Indicator D.4.3.2 Number of Irrigated Feddans where Water Delivery is Managed through Participatory Processes

Assuming that introducing participatory water management is a declared policy objective then this indicator will track how well that objective is being achieved. The number of irrigated feddans where water delivery is managed through participatory processes is a direct indicator of public and private partnerships in water delivery to the agricultural sector, which will eventually increase water use efficiency and improve water allocation. A feddan is the traditional Egyptian land measurement unit and is approximately equal to one acre.

A participatory process is evidenced through meeting at least one of the following criteria avoiding double counting: (1) farmers contract with the private sector for water services,

(2) water boards are established, or (3) water users/farmers associations exist. These data are tracked and reported in these categories by the MWRI.

Data on farmer participation in the three categories mentioned will include both old and new lands occupied by participating farmers. This will include all such lands at all levels of the irrigation canal system, with no duplications. In addition, it will also include farmers organized in areas where groundwater is the only source of irrigation. Known data is shown in table 25.

Table 25 Number of Feddans under Participatory Water Management

	Baseline Year (1999)	2000	2001	2002	2003	2004
Planned		198,000	237,600	297,000	371,250	482,625
Actual	165,000	187,507	293,956	438,337		

Source: MWRI tracks the number of irrigated feddans satisfying each of the three criteria. Alternative sources include National Irrigation Improvement Project annual progress report, and the Dutch assistance program reports.

MWRI reports the number of irrigated feddans in each of the three categories of participatory water management. The value of the indicator in any year is the sum of the number of irrigated feddans in each of the three categories.

Upon conclusion of APRP in September 2002, the USAID Egypt Mission plans to shift future policy reforms and technical assistance to the EEPP Results Package. The Mission will continue to focus program support to MWRI on the critical policy reforms that enable Egypt to conserve, protect, and manage water resources more efficiently. The actual figures for 2001 exceed the target significantly. However, the mission chooses not to adjust future targets accordingly at this time until this proves to be a trend.

E. Coastal Zone Management

PRINCIPAL PROBLEMS

- Increased threat of environmental degradation of both terrestrial and marine natural ecosystems in the Red Sea due to increasing development pressure.
- Improper environmental planning of tourism development in the Red Sea region.
- Limited institutional capacity in environmental management in the Red Sea region, specifically within Protectorates.

EEPP TRANCHE 2 POLICY MEASURES

- Strengthen institutional and technical capacity of EEAA Nature Conservation Sector to manage conservation in the Red Sea region.
- Develop land use zoning policy and management systems that protect the most important ecological areas in the Southern Zone of the Red Sea region.
- Improve TDA capacity to develop and implement improved EIA review system and procedures and effective EIA monitoring systems.
- Promote environmental best practices in the Red Sea tourism developments.

PROPOSED EEPP MONITORING SYSTEM INDICATORS

- Number of hotel rooms and number of tourist nights in Red Sea
- Volume of fees collected
- Number of park rangers
- Number of mooring buoys
- Number of hotel facilities with best practices
- Water quality
- Coral reef quality (under construction)

E.1 BACKGROUND

Since the late 1970s, the Red Sea coastal zone has witnessed accelerating growth in the tourism industry. The region has a relatively pristine coastline and a coral reef system of global importance. The region's tourism development thus far and future potential are a high priority to the GOE as a source of foreign exchange and as an alternative population and economic growth center to the Nile Valley and Delta. Tourism development in the Red Sea coastal region has dramatically increased environmental degradation of both marine and terrestrial systems. If unchecked, the resulting irreversible harm to the region's natural resources will undercut the GOE's long-term social and economic objectives for the region by reducing its sustainability as a major tourism destination.

The GOE has recognized this danger and is actively pursuing improved policies to minimize environmental damage from tourism development, including establishment of protectorates and staffing of these protectorates with trained park rangers to ensure the protection of the several hundred kilometers of coastline. The Protectorate system has also led to a stronger environmental monitoring program, meant to minimize environmental damage from tourism development.

E.2 EEPP POLICY MEASURES

EEPP is currently working in Tranche 2 to address the sustainable tourism development challenges in the Red Sea region through several initiatives with specific policy objectives, which include the following:

1. **Enhanced management and conservation of the Egyptian Red Sea coral reefs, islands, and linked ecosystems of importance (Objective 2).** Policy initiatives include assistance to EEAA to strengthen its regional institutional and technical capacity to manage conservation in the Red Sea region by adding more trained rangers, establishing financial mechanisms (fee systems, budgetary resources) to support its annual operations, and developing a participatory conservation management plan that involves other stakeholders such as diving operators and local NGOs in the southern zone.
2. **Sustainable Red Sea land use management linked to ecosystems of importance (Objective 7).** Initiatives undertaken under this policy objective include assistance to TDA to develop land use zoning plans and formulate regulations to increase environmental compatibility with surrounding ecosystems in the Southern Zone of the Red Sea region.
3. **Red Sea tourism development environmental monitoring policy strengthened (Objective 8).** Policy initiatives include assistance to TDA to improve its capacity to review and track the EIA process and the subsequent compliance monitoring of tourism developments with the relevant terms and conditions and others related to the construction permit.

4. **Environmental best practices promoted in Red Sea tourism developments (Objective 9).** Policy initiatives include assistance to TDA to promote sustainability of EMS by encouraging the tourism facilities in the Red Sea region to adopt environmental best practices on a voluntary basis through dissemination and economic instruments during the design, construction, and operation phases.

E.3 Overall Conclusions Based on Indicators

The data and indicators on the pressures on the environment below clearly indicate that the pressure is increasing. Present plans for the development of the region indicate that the amount of pressure will accelerate yet further in the coming years. The information now available on the state of the resources, while inadequate, shows deterioration and it may be expected that the more and better information that is produced, the more deterioration will be shown. The information that is presently known on the planned responses to the problem, whether employing Rangers or installing mooring buoys, indicate that the responses will also be inadequate given 700 km of coastline and more than 10 million tourists per year.

E.4 Indicators

E.4.1 Background

EEPP interventions aim mainly at establishing a sustainable policy framework for the environmental sector in Egypt. EEPP interventions thus far have focused primarily on basic environmental management policy and strengthening the environmental management capacity of EEAA and TDA. Accordingly, the indicators selected to monitor EEPP measure the impact of efforts to improve coastal zone management of the Red Sea region. In addition to indicators that directly relate to EEPP interventions (e.g., mooring buoys, diver fees), the monitoring system was designed to also include some indicators that measure the development "pressure" on the environment in the Red Sea region (e.g., number of tourist nights, number of diving trips).

Improvement of environmental management capacity ultimately is meant to slow the damage to Red Sea natural ecosystems caused by increased tourism development pressure. Therefore the monitoring system also includes indicators that monitor the state of natural resources in the region (e.g., water quality, coral reef quality). Very limited data will be available for these indicators in this report or in subsequent reports in the near future. However, in the longer term, they will be of substantial value with the accumulation of data.

E.4.2 Condition of Natural Resources

Natural resources in the Red Sea region could include air and water quality as well as ecosystems such as the coral reefs, mangroves, wadis, etc. The distinct lack of information mandates choosing to use, on the one hand, what information does exist such as the EIMP water quality data, and, on the other hand, concentrating on the most important ecosystem—coral reefs—for development of new data.

The MVE report "Building a System to Monitor Development Impacts on Red Sea Ecosystems: Biological Indicators," of 2002, says:

> There are not likely enough data available to develop indexes for the other major ecosystems or landscapes identified above. However, the search must continue among existing data sets and worldwide experience to determine if other data and methods exist to evaluate potential attributes in other selected ecosystems. The methods are developed for evaluating attributes and developing metrics for selected organisms in marine substrates other than coral reefs. And recent experience is showing the potential to develop indexes for terrestrial ecosystems. Of particular interest is the recent work to develop an index based on invertebrates in arid lands. New data must be collected to fully evaluate the most promising attributes.

Indicator E4.2.1 Coastal Water Quality

Coastal zone pollution is one of the major threats to the health of Red Sea aquatic ecosystems and Red Sea tourism. Tracking water quality is a key to monitoring the situation in order to assess the magnitude of the problem, determining whether pollution control strategies are working, and identifying major sources of pollution.

Developing simple indicators of water quality can be difficult. When the primary concern is human health, it is easier than when the concern is biodiversity. EIMP has identified several water parameters that provide a frame of reference for evaluating coastal water quality. These parameters were measured in a network that included 15 stations in the Red Sea region (Red Sea Proper). These parameters were classified in three categories:

- Basic parameters (total suspended solids; vertical profiles of salinity and temperatures; and visual observations of litter, oil, and tar on beaches)
- Bacteriological parameters (total coliform, foecal coliform, and foecal streptococci)
- Eutrophication parameters (water transparency, nitrate/nitrites, ammonia, total nitrogen and phosphorus, phosphates, silicates, and chlorophyll).

Table 26 shows that 8 of 15 stations had exceeded the bacteriological water quality standards (500 CfU/100ml for total coliforms and 100 CfU/100ml for E. coli and Foecal streptococci) on at least one occasion for at least one bacteriological parameter in the year 2000. Bacteriological water quality was often exceeded at the Bir Shalatin and Quseir

sites, which were categorized as highly polluted and polluted, respectively. The main sources of pollution are from the fishing harbor and tourism activities.

Table 26 Red Sea Stations Where the Bacteriological Water Quality Exceeded Standards in 2000

Station (Red Sea Proper)	Percent of Samples Exceeding Criteria for Total Coliform	Percent of Samples Exceeding Criteria for E. Coli	Percent of Samples Exceeding Criteria for foecal streptococci	Degree of Pollution by Bacteria	Likely Source of Pollution
Hurghada (Sheraton)	33	50	0	Relatively polluted	Tourist activities
Sa`l Hashish	17	17	0	Slightly polluted	Tourist activities
Safaga (north)	0	50	0	Slightly polluted	
Safaga (middle)	17	17	33	Relatively polluted	Safaga harbor
Quseir (north)	33	50	33	Polluted	Tourist activities
Quseir (middle)	0	0	17	Slightly polluted	
Quseir (south)	17	17	0	Slightly polluted	
Bir Shalatin	100	100	83	Highly polluted	Fishing harbor, sewage

Source: EIMP

Eutrophication is characterized by the growth of phytoplankton and seaweed stimulated by nutrients discharged from sewage such as ammonia, nitrates, nitrites, and phosphate. In 2000, the levels of measured eutrophication parameters were generally low in all the Red Sea stations (see table 27).

Table 27 Annual Mean Concentration of Eutrophication Parameters in the Red Sea Region in 2000

Parameters	Concentration
Ammonia (NH_4-N)	
Nitrate and Nitrites	
(NO_3-N and NO_2-N)	0.39 μM
Phosphate (PO_4)	
Silica (Sio_4-Si)	
Chlorophyll-a	0.13 μg/l
Total Suspended Matter	5.8 mg/l

The data collected by EIMP showed that the bacteriological water quality has been deteriorating in some sites in the Red Sea region since measurement began in 1998. The deterioration trend could be explained by the increase in the tourism activities in the region. In the future, analysis of spatial variations may provide more information on water quality relevant to differentiated intensity of tourism development in different zones. This could establish a clearer correlation between level of development and water quality deterioration. MVE is looking for historical data and for clarification on sampling methods.

Indicator E4.2.2 Coral Reef Quality and Extent

Perhaps the prime goal of improved management and conservation in the Red Sea region is protecting the extent and quality of the coral reefs and linked ecosystems. A set of data and possibly indicators that provide direct information about the extent and quality of the reef ecosystems will be valuable, if it can be established.

Developing relatively simple measures of ecosystem quality and extent is difficult. The quality of the reef, in particular, is hard to define. To assess this, it is necessary to have good data regarding reef species composition, the numbers of different species, and the normal variation that occurs in responses to natural fluctuations in weather or other factors. It is possible that the extent but not the quality or health of coral reefs in the Red Sea may be obtained through satellite imagery analysis and GIS mapping efforts now going on in EEPP.

Given a thorough understanding of how the systems operate naturally, it may be possible to identify changes due to human intervention in the region, and to differentiate human-induced changes from those that occur naturally. This ability could be built into a monitoring system that can distinguish between natural variation that the system has the resilience to resist, human interventions that the system can resist, and human interventions that will cause permanent degradation of the system.

A baseline sampling of coral reefs was developed in 1999 by EIMP. The 14 coral monitoring sites were the same or close to sites where water quality samples were taken in the Red Sea region, covering the area from Hurghada to Marsa Alam. Different parameters, including living species (i.e. corals, algae, mollusk) and non-living objects (i.e. sand, rock, rubbles, dead corals) were measured using a quadrate technique of one square meter at two different depths. The final results on the quality and extent of the coral reef ecosystems have not yet been published.

The MVE analysis "Building a System to Monitor Egyptian Red Sea Protection and Development: Biological Indicators," of 2002 examines the data that do exist for the Red Sea coral reefs as developed by the Red Sea Integrated Coastal Zone Resource Management Project, funded by the Global Environmental Fund (GEF), Environmental Sustainable Tourism Project (EST), UK Marine Conservation Society (MCS) Reef Monitoring Program, Suez Canal University (SCU), and Dr. Mohamed Abou Zaid. Preliminary conclusions support the idea of attempting to use live coral coverage and

abundance and taxonomic richness of butterfly fish to get some way to compare coral reef quality across space and over time, at least in the short run. In the long run, more robust measures, perhaps even an Index of Biological Integrity could be built using these parameters and others such as fish species. It is more important to begin to test something now and report on this over the next year. More information on these possible parameters is presented in table 28.

Tony Rouphael of the EEPP PSU points out that: "developing a practical index of 'coral reef health or integrity' is conceptually appealing but may be an impossible goal for naturally variant systems like coral reefs and other marine ecosystems. Unlike human health, which have has an 'optimum state' that is actively maintained by the body, ecosystems have no such optimum - there is no such thing as a normal equilibrium state. As you know, coral cover on the same reef can vary from 5% to 90%, even in the absence of human activity. Consequently, because of this considerable normal variation, to measure a human impact on marine environments, we need to compare a disturbed site with multiple reference or control sites. Nevertheless, although I would discourage the adoption of an index of reef health, I think we need to at least take a punt at specifying an acceptable level of change for a given variable. For example, at a popular dive site we might accept a 10% increase in the proportion of damaged corals relevant to the proportion of dead corals at our reference sites."

Further, he states that: "Choice of indicator or variable will depend on the question being asked. For example, a useful indicator of anchor damage might be the abundance of coral rubble; the proportion of broken coral colonies; or coral growth form composition. An indicator of commercial fishing pressure might be the composition of target species; abundance of individual species or their mean length. An indicator of disturbance associated with marina construction and operation might be the abundance of dead standing coral; coral colony size composition; or the mean abundance of bio-eroders such as burrowing sponges etc."

The implication of these comments and those made by others is that EEPP and, in fact, EEAA itself, is a long way from developing and implementing a system of indicators of coral reef health in the Red Sea. Even the conceptual development of this – deciding what to measure and how – is not yet established. This could represent an important task for the follow-on project to EEPP if the Red Sea remains an area of emphasis.

E.4.3 Tourist Facilities

Indicator E4.3.1 Number of Tourist Nights in the Red Sea Governorate

Tracking the number of tourist nights at each site will provide essential information for several planning purposes. This data would provide information about the growth of tourism in the region and indirectly the increase in the pressure on the natural resources in different locations in the region.

Table 28 Possible Components of an Index of Biotic Integrity for Coral Reef Ecosystems of the Red Sea

Indicator	Description	Status of Data
1. Live coral coverage	Observations along transects and photos of frame-plots are used to measure percent of live corals. Methods are used in other oceans and are partially tested/calibrated for the Red Sea.	Data can likely be used from four sources: GEF 80 sites, British MCS for 48 sites, Suez Canal University 19 sites, and Abou Zaid 75 sites.
2. Coral species	Requires more research. The available data might support attributes of richness, dominance, or other attributes.	Data on 80 sites from GEF project..
3. Percentage of damaged hard coral	Based on the percentage of coral rubble and broken formations observed in a 20m transect. The metric is fully calibrated for the Red Sea.	Results published for 37 dive sites in the Hurghada area (Jameson 1999); may need to acquire original data. Need to collect data for sites in the south.
4. Reef fishes	Requires more research. The available data might support attributes of richness, dominance, or other attributes.	Data can likely be used from: GEF 80 sites, British MCS for 48 sites, and Suez Canal University 19 sites.
5. Abundance of butterfly fish	The number of individuals of obligatory corallivorous butterfly fish per area/transect. The method has been used to develop metrics for other oceans, but needs to be calibrated for the Red Sea.	Data can likely be used from four sources: GEF 80 sites, British MCS for 48 sites, Suez Canal University 19 sites, and Abou Zaid 75 sites.
6. Taxonomic richness of butterfly fish	The number of species of obligatory corallivorous butterflyfish per area/transect. The method has been used to develop metrics for other oceans, but needs to be calibrated for the Red Sea.	Data can likely be used from four sources: GEF 80 sites, British MCS for 48 sites, Suez Canal University 19 sites, and Abou Zaid 75 sites.
7. Economically valuable invertebrates	This metric will require more research to determine what has been learned in other oceans and to evaluate potential attributes that might be derived from the Red Sea data.	Data can be used from 20 or more sites surveyed by British MCS.
Coral Integrity Index	Sum of 7 or more indicators that may be developed from the above list. The index needs to be calibrated. Weighting of individual metrics should be tested.	Bio-criteria could then be proposed, establishing minimally acceptable integrity of coral reefs.

Source: "Building a System to Monitor Development Impacts on Red Sea Ecosystems" published 2002

Table 29 shows that the number of tourist nights in the Red Sea Governorate reached nearly 11 million in 2001, which is more than double (128 percent) the number of tourist nights in the Red Sea region in 2001.

Table 29 Tourist Nights in the Red Sea Governorate, 1996–2000

Year	Egyptian Tourists	Foreign Tourists	Total Tourists	Number of Rooms
1996	579,153	4,225,738	4,804,891	12,881
1997	675,535	5,183,880	5,859,415	14,950
1998	871,096	2,906,713	3,777,809	18,075
1999	900,084	6,879,603	7,779,687	22,159
2000	829,612	3,072,525	3,902,137	28,761
2001	915,648	10,067,082	10,982,730	
Change			1996–2001 128%	1996–2000 123%

Source: EEPP/PSU Data and Information Needs Report, 2002 (Original source: Tourism and Investment Department, Red Sea Governorate).

In response to the perceived increase in demand, the Red Sea tourism industry doubled its capacity by developing more resorts and hotels along the coastal zone. The number of available rooms increased from 12,881 in 1996 to 28,761 in 2000 (more than double). There are proposals for at least 240 major resorts to be built by the year 2020 along the Red Sea, and the population is expected to increase correspondingly at a rate of 10–15 percent annually.

The spatial distribution of these hotel rooms shows where Red Sea coastal resources are facing greater pressure. In general, development pressure is moving from the near-saturated northern zone to the relatively undeveloped Southern Zone. In addition, the rate of development of the Southern Zone is accelerating due to the recent opening of a new international airport in Marsa Ghalib. In order to better understand where development pressure, and consequently pressure on coastal resources is, it might be useful in the future to break down the indicator by area to track Northern vs. Southern Zones, or even to compare specific stretches of shoreline.

Indicator E.4.3.2 Percent of Tourist Facilities with Approved EIAs before Construction

Proper protection of Red Sea natural resources, by enforcement of Law 102/1983, will help ensure sustained employment opportunities and hard currency earnings. The EIA mechanism, as promulgated by Law 4/1994 represents the basic tool of environmental management to secure environmentally sound development (tourism and other) in the region. Prior to full implementation of Law 4 in 1997, some projects were constructed or began operation without submitting an EIA and/or receiving approval based on

completion of an EIA. Lack of compliance with EIA procedures has contributed to environmentally unsound development in the region. Table 30 shows progress in securing compliance with the EIA procedure, taking 1999 as the baseline year.

Table 30 Percent of Tourist Facilities in the Red Sea Region that are Constructed after Receiving an Approved EIA

	Baseline Year: 1999	2000	2001	2002	2003	2004	2005	2006
Planned		25	35	50	65	85	95	100
Actual	20	22	38					

TDA's current monitoring system tracks whether a proposed project has completed an EIA. Theoretically, no project is given a construction inception permit without an approved EIA. Therefore, the need to monitor the number of projects that are not subject to an EIA is no longer necessary, as this number will always be zero, assuming there is no system leakage. The problem is not the ones that don't need an EIA; it is the ones that begin without one. Individual cases of violation should be detected easily and a construction moratorium for the project immediately issued. In fact, though, it is still reported that some are continuing to construct though this construction may be in back areas and it is said that EIAs continue to be approved in Cairo even though the projects are being sited in sensitive areas such as wadis and near mangroves. Making better use of "eyes in the field" (EEAA Rangers) would improve the EIA process.

Indicator E4.3.3 Percentage of Hotel Rooms in Facilities Located on TDA-owned Land in the Red Sea Region that Instituted Best Practices

Adoption of best practices by hotels in environmentally-sensitive areas helps ensure that damage to the Red Sea environment (including offshore resources) is minimized. An approach to encourage environmental best practices (BPs) was adopted by TDA several years ago, and taken up by hotel developers on a voluntary basis. TDA also developed a BP manual, conducted dissemination and promotion activities, and established a simple database for tracking BPs adopted during Tranche 1 of EEPP.

BPs have been defined in the TDA publication "Best Practices for Tourism Center Development along the Red Sea Coast" and approved by the GOE. The identified BPs cover several sectors including water use, energy use, and solid waste. The program objective is to achieve the adoption of BPs for 65 percent of all hotel rooms existing on TDA-owned lands by the year 2004, and 95 percent of all hotel rooms existing on TDA-owned lands by the year 2009. Table 31 shows the progress made.

The use of BPs should lead to significant reduction in the use of energy and water consumed and solid waste produced. Substantial guidance for BP selection is provided by audits already undertaken by the contractor for hotel properties in the Red Sea region

and elsewhere. This indicator is mainly concerned with the "operational" BPs in hotels that are already operating. TDA also is promoting the use of BPs during the facility design and construction phases of a project. Therefore, it likely makes sense to begin monitoring BPs implemented by operators during these phases as well. Currently, very limited data are available for these parameters.

Table 31 Percentage of Tourist Facilities Implementing Best Practices

	1999 (Baseline Year)	2000	2001	2002	2003	2004
Planned		42	47	53	59	65
Actual	38.1	43	45			

Source: Tourism Authority (TDA) Best Practices Monitoring Reports (semiannual), Best Practices for Tourism Center Development along the Red Sea Coast (regularly updated), and TDA field inspection reports (continuous).

Data are periodically obtained by TDA through regular surveys of Red Sea hotels and resorts. In 2001, 45 percent of hotel rooms and facilities on TDA-owned lands in the Red Sea region had adopted at least one BP.

Increasing BP adoption is a policy measure in EEPP Tranche 2. The data presented shows that Red Sea hotels and resorts are continually adopting Best Practices and therefore implementing acceptable environmental standards in their operations. Monitoring BP adoption has a two-fold function. First, it is an indication of likely reduction in damage to the environment. Second, it measures TDA effectiveness promoting BPs, which will lead to a more sustainable tourism industry in the Red Sea region.

Adequate BP monitoring could provide valuable inputs in developing policy measures that increase BP adoption. Breaking down BP adoption into categories would be very helpful in this regard.

E.4.4 Diving Activity

Indicator E.4.4.1 Number of Dive/Snorkel Trips

A large portion of Red Sea tourists are attracted to the region for activities related to its distinctive—but highly sensitive—coral reef ecosystems. The primary activities are snorkeling, scuba diving, and related activities. Knowing how many divers there are can be important context information for several reasons. Information about the number and location of diving/snorkeling activities will be valuable in directing EEAA limited resources to vulnerable areas to minimize the damage to natural resources, including coral reefs. Congestion among divers on the reefs is also a deterrent to potential tourists, so knowing the number and location of diving activity will help in managing the market.

It is also one source for generating revenue to support coral reef conservation by charging special fees for diving;

Table E-6 shows that the total number of diver and snorkeler days in the Red Sea for the year 2001 was 768,069, of which 72 percent were divers (or 552,143) and 28 percent were snorkelers (215,926). This represents a 9 percent decrease from the number reported in 1999. The Hurghada region, which accounted for more than two-thirds (or 72 percent) of the total number of divers/snorkelers in 2001, is still the major attraction region for this tourist activity.

With the exception of Marsa Alam, all the other sites showed a decrease in the total number of divers and snorkeler days for the same period. Two possible explanations could be formulated from these trends. First, data on snorkelers for the Quseir and Marsa Alam sites were not reported for both years. This may suggest that the numbers reported in table E-6 are underestimated and therefore do not represent the actual numbers. Second, if the data are correct, then this trend suggests that divers and snorkelers are going down to the south where new diving centers may be developing adjacent to the new tourism developments. This possibility is supported by the fact that in Marsa Alam, located in the Southern Red Sea Zone, the total number increased tremendously from 1999 to 2000. The numbers available—4,188 in 1999 and 88,549 in 2000—are an increase of more than 20 times, which is clearly impossible and likely due to the system for gathering information. Better numbers will be sought; however, the trend is expected to be similar.

Tourism activities such as diving and snorkeling have contributed significantly to the current stress on coral reefs and other coastal habitats in the Red Sea, especially in Hurghada and its surrounding regions, where diving centers are located. High levels of stress may result in mortality of corals and other organisms. Probably, the coral reef will continue to experience stress at an accelerating rate in the future, because of a continued increase of diver/snorkeler activities in the region.

Any attempt to protect the remaining healthy reefs from further degradation must include decisive action, which includes the development and implementation of an effective conservation management plan, including the restoration–rehabilitation of damaged sites and the conservation and protection of others.

Indicator E.4.4.2 Number of Mooring Buoys Installed in the Red Sea Region

Direct damage may be caused to coral reefs by diving boats anchoring to them. To prevent this damage, mooring buoys can be installed at popular dive sites, with boats being moored to the buoys. EEPP is encouraging the placement of mooring buoys in popular areas to address this need. Tracking the number of mooring buoys will provide a measure of one response to perceived damage or risk of damage due to boat anchoring.

Table 32 Number of Diver/Snorkeler Days in the Red Sea Region, 2000 and 2001

Diver Sites	2000			2001			Percent Increase
	Divers	Snorkel	Total	Divers	Snorkel	Total	
Hurghada	440,139	231,514	671,653	345,462	204,647	550,109	(18)
Safaga	136,760	220	136,980	97,616	11,264	108,880	(28)
Quseir	29,661	—	29,661	20,516	15	20,531	(31)
Marsa Alam	4,188	—	4,188	88,549	—	88,549	2,014
Total	610,748	231,734	842,482	552,143	215,926	768,069	(9)

Source: EEPP/PSU Data and Information Needs Report, 2002 (Original Source: Intelligence Office of Coastal Guards).

Among the NCS's responsibilities is improving marine services, such as installing more mooring buoys. Properly installed mooring buoys help to minimize damage to coral reefs by dive boat anchors. Increasing the number of mooring buoys is a good indicator that EEAA is increasing its Red Sea environmental management facilities. The buoys also are a source of revenue enhancement for EEAA because boat owners are required to pay a fee for using them. In addition, monitoring the number of boats at specific mooring buoys could be an indicator of the pressure on resources at a given site. Table 33 tracks the number of installed mooring buoys since 1998.

Table 33 Number of Mooring Buoys in the Red Sea Region

Area	Before 1996	1996	1997	1998	1999	2000	2001	2002	2003
Hurghada	45	30	208	244	289		271	261	261
North	0	0	0	35	50		50	50	50
Safaga	0	15	15	60	72		72	72	72
South	0	0	0	90	130		137	137	215
Total	45	45	223	429	541		530	520	520

Source: Mohamed Habib, PSU Hurghada

Between 1996–98, USAID assisted EEAA in the installation of nearly 500 mooring buoys around and south of Hurghada. In Tranche 2, EEPP is assisting EEAA to develop a financially sustainable mooring buoy program in the southern zone with locations determined through a process that includes participation by local stakeholders. This initiative includes installation of new mooring buoys in the southern zone and the maintenance of buoys in the northern zone.

Including all stakeholders in the mooring buoys program is critical to its sustainability. EEAA worked with HEPCA, a local NGO based in Hurghada, to install mooring buoys in the northern zone. EEAA is currently working with local stakeholders in preparation

of a Southern Zone conservation management plan. A main component of this prospective plan is installation of mooring buoys in the southern zone.

In fact, an opportunity is being missed to test the efficacy of mooring buoys. Tony Rouphael of the EEPP PSU comments: "moorings buoys are currently (Dec 31 2002) being placed at high use reefs in the south e.g Elphinstone. Unfortunately, no baseline on coral community structure or the abundance of physical coral damage at these reefs is available. Further, there are no plans to monitor coral community structure so as to test the prediction that the mooring strategy will reduce the amount of coral damage and /or will permit recovery of damage communities. It is also a pity that there are no plans for a follow-up survey to assess whether boat operators are actually using the moorings."

E.4.5 Management of the Red Sea Coast

Indicator E.4.5.1 Number of Qualified EEAA Rangers in the Red Sea Governorate

The Government of Egypt has declared protected areas in the Red Sea Region and has announced its intention to eventually enlarge the area under protected status. Park rangers are needed to enforce the nature protection statute (Law 102/1983), as well as to monitor the environmental impact of economic development in the Red Sea Region.

In 1999, there were 10 rangers, which was inadequate to enforce the law in the area already under protection, let alone a proposed expansion. In 2002, the total number reached 39, still short of the projected need. It is expected that additional rangers would be hired to fill new offices located in Hurghada, Quseir, Marsa Alam, and Shalatin, and also possibly in Safaga and the Wadi Gamal area. The number of rangers hired by EEAA depends largely on financial resources being available to the agency's NCS to recruit and retain personnel, as well as equipping offices, purchasing patrolling and enforcement equipment, and furnished living accommodations.

An increasing number of EEAA rangers is a measure of increased commitment to protecting the Red Sea coral reef ecosystem and to sustainable development within the Red Sea Governorate. EEAA has increased this number from 10 in 1999 to 39 in 2002. EEPP calls for EEAA to increase its contingent of NCS rangers to at least 50 by the end of Tranche 2. Given the current trend of NCS ranger hiring, EEAA is expected to achieve this target.

The number of park rangers working in the Red Sea Region reached 36 in 2001, an increase of 56 percent from year 2000, and reached 39 in 2002, a slight increase of 8 percent from 2001. Table 34 shows the number of rangers for which EEAA planned, and the actual number on staff from 1999–2004.

However, the effectiveness of coastal ecosystems protection and management in the Red Sea region relies not only on the number of qualified rangers but also includes the scope, coverage, and quality of their operations. Since 1997, USAID has played a major role in

providing financial resources needed. Gradual take-over by EEAA of these financial responsibilities will be an additional indicator of the success of the EEPP policy and will have an impact on the ultimate goal of sustainable management of Red Sea resources. By the completion of Tranche 2, the objective is for EEAA to cover the majority of the ranger's operating costs in the Northern Zone.

Table 34 Number of Qualified EEAA Rangers in the Red Sea Governorate

	1999 (Baseline Year)	2000	2001	2002	2003	2004
Planned		20	25	30	40	50
Actual	10	23	36	39		

Source: EEAA Nature Conservation Sector

Indicator E4.5.2 EEAA Annual Budget for Red Sea Conservation

Encouraging EEAA to take responsibility for financing its conservation activities in general, and its conservation work in the Red Sea in particular, is an objective of EEPP. Monitoring the EEAA budgetary contribution to these costs will show to what extent conservation activities in the Red Sea are sustainable.

The EEAA budget for the Alba and Red Sea Protectorates reached LE 5,894,831 in 2000–01, of which 60 percent was for non residential buildings, 23 percent for operational costs, 9 percent for furniture and office equipment, and 8 percent for equipment and machines. The 2001–02 budget represents nearly four times the 1999–00 annual budget of LE 1,207,000. This represents a significant effort by EEAA to support its management activity in this region. However, current data do not show the breakdown of the budget by sources of funding to see how much EEAA is supporting from its internal sources. Table 35 shows budget figures since 1999.

Table 35 EEAA Budget for Alba and Red Sea (in LE)

Item	Budget 1999–00	Budget 2000–01	Share of the Total Budget 2000–01 (Percent)
Non-residential Buildings	947,000	3,527,831	60
Equipment and Machines		500,000	8
Operational Costs Hold (including salaries)	150,000	1,357,000	23
Furniture and Office Equipment	110,000	510,000	9
Total Budget in L.E.	1,207,000	5,894,831	
Share of GOE Budgetary Sources in the Total Budget*	—	—	

* Not available. Source: EEAA

A significant increase in budget allocated to the Red Sea Region likely will lead to better protection and management of the Red Sea coral reefs and linked ecosystems. Increasing the budget allocation also will contribute to achieving the EEPP objective of enhanced management and conservation of the Egyptian Red Region. In addition to increasing the total Red Sea Protectorate budget, EEPP aims to increase funding from EEAA's internal budget to support the operational and maintenance costs of the Northern Zone offices. The EEPP program calls for EEAA/NCS to increase its budgetary resources to cover at least 50 percent of its operation in the Northern Red Sea Region (Hurghada/ Quseir). As information on the EEAA share becomes available from Tranche 2, Policy Measure 2.1 it will be included here.

Indicator E4.5.3 Value of Fees Collected for Natural Resources including the Red Sea Protectorate

Entry fees are charged in the majority of protectorates in Egypt. User fees are a reasonable way to raise funds to help pay for conservation of natural resources, and EEPP encourages their use for revenue generation in Egypt. Fee systems also can be an efficient tool to control pressure on sites that are sensitive, contributing to their protection. To assess the potential of such fees and the contribution they are making to the costs of conservation, it is useful to track the amount of fees collected at each site. This will provide information about the share of fees in the total costs of control and conservation of these sites.

Table 36 shows receipts generated as entrance fees to protectorates in Egypt from 1998 to 2001. The data do not specify whether receipts included any additional fees charged to divers and snorkelers.

Table 36 Environmental Protection Fund Receipts from Protectorates in Egypt, 1998–2001 (in L.E. equivalent)

Protectorate	1998–99	1999–00	2000–01	Share of Total (Percent)
Ras Mohamed	4,144,992	5,277,117	5,639,873	77
Red Sea (Giftuns and Far Islands)	490	748,234	1,605,607	22
Wadi el-Ryan and Karoun	80,950	112,653	94,913	1
El-Zaranik	6,070	2,684	0	—
Nabq	820	1,595	1,731	—
Saint Catherine	0	1,592	0	—
Elba	0	0	270	—
Taba	0	5	0	—
Total	4,233,322	6,143,879	7,342,393	
Annual Increase (Percent))		45	20	

Source: EEPP/PSU Data and Information Needs report, 2002 (Original Source: EEAA).

In 2000–01, the EEAA EPF earned L.E. 7.3 million in entrance fees receipts from protectorates, which represents an annual increase of 20 percent over receipts earned in 1999–00. About 22 percent of this revenue came from the Red Sea Protectorate. Ras Mohamed Protectorate (Sinai Peninsula) contributed 77 percent of the total receipts.

In the Red Sea Region, EEAA implemented an entrance fee program for the Giftun Islands in April 2000. The start of this program explains the doubling of EPF receipts in the Red Sea by 2000–01 (from L.E. 748,234 in 1999–00 to L.E. 1,605,607 in 2000–01). The current entrance fee to the Giftun Islands is US $2 per person for foreigners and L.E. 2 per person for Egyptians. For the Far Islands, the entrance fee is $35 per week for foreigners and L.E. 35 per week for Egyptians.

The fee system has been a good mechanism for providing EEAA additional financial resources needed to strengthen its capacity in coastal zone management in the Red Sea Region. An increase in total revenue from fees can be an important financial source for supporting conservation and protection activities in Egypt in general and the Red Sea Region in particular. It is one of the specific results targeted by EEPP in Tranche 2. An increase in income from visitor fees is an opportunity to increase NCS revenues for sustainable conservation activities. Increased fee revenue also is a good incentive for EEAA to increase its NCS staffing. Increased staffing would allow EEAA to recover the fees from all the visitors (through improved enforcement of fee collection) and also to expand a management presence and extend protectorate status to other regions of interest in the Southern Region of the Red Sea. How much impact the increase in revenues from the fee system will have on strengthening EEAA/NCS capacity will depend largely on how much of the EPF funds generated from the Red Sea go back to the NCS for management activities in the region.

Indicator E.4.5.4 Revenues from Diver and Snorkeler Fees in the Red Sea

This indicator is different from the one described above. Indicator. E.4.5.3 relates specifically to fees collected from protectorates in the Red Sea, the protected islands, and others. But this indicator (E.4.5.4) may relate to all diving and snorkeler fees collected even in areas other than protectorates, such as Hurghada city. This does not include Sinai areas (Ras Mohamed Marine Park and others).

Historically, revenues collected by EEAA for diving and snorkeling are not actually counted on that basis. Visiting the protected islands that are well marked as a destination for divers is the basis for fees collected regardless of the actual activity. The fees collected are per day of visit. The fees that are of concern here are those collected by EEAA, assuming they are reallocated to improve the overall environmental management of the Red Sea ecosystem.

Fee collection started in May 1998 in the protected Red Sea islands (Far Islands) and started later in 2000 in the Giftun islands.

Table 37 illustrates total revenues of Red Sea Protectorates in the years 2000 and 2001. Earlier data exists, but only for Far islands. The baseline year was taken as 2000.

Table 37 Total Revenues from Red Sea Protectorates

Sites	Year							
	2000	2001	2002	2003	2004	2005	2006	2007
Giftun islands	942,507	881,546						
Far islands	728,152	1,172,060						
Total	1,670,659	2,053,606						

The data shows an upward trend that may relates mainly to the increasing efficiency of the fee collection function rather than the mere increase in visitors number.

The detailed data at the individual site level show clearly that applying the fee system has a well identified impact on the spatial distribution of divers, shifting from destinations with fees to others with no fee system. This indicates that aside from revenues collected and their role in upgrading the overall environmental management of the area, fee systems could be an effective instrument in managing balanced use of local ecosystems, especially if such fees could be variable on an annual or biannual basis.

F. General Environmental Management

PRINCIPAL PROBLEMS

Environmental management institutions are weak; insufficient resources are available and applied; environmental management is centralized; and there is a lack of public–private partnerships.

EEPP TRANCHE 2 POLICY MEASURES

- Institutional Strengthening and Decentralization of Environmental Management within EEAA
- Improving economic situation of environmental management.

PROPOSED EEPP MONITORING SYSTEM INDICATORS:

- Balance of EEAA staff, funds, and operations between Cairo and Regional Branch Offices
- EEAA inspection activities
- Planned investment and actual expenditure for environmental protection
- EPF revenues, recipients, management
- Level of government employment in environmental protection
- Environmental laboratories accredited
- Policy reforms achieved.

F.1 BACKGROUND

Given the fragmentation of environmental mandates and responsibilities and the strong relationship between environmental issues and economic and social issues, monitoring the Egyptian environmental management sector requires the use of overall general indicators. These indicators reflect the importance society gives to environmental protection and the ranking of environmental issues as manifested by allocation of resources. They also help inform the decision makers' choice of policy measures and

instruments. In addition, they are useful in addressing cross-cutting issues such as decentralization of environmental management.

The Environment Sector Assessment Study of 1998 grouped key constraints and weaknesses in policies that impede effective environmental management and efficient utilization of natural resources into three categories. These include:

1. Flaws in the structure of economic incentives to utilize resources and the environment
2. Weaknesses in institutional capabilities (Information and Analysis/Institutional Strengthening/Sustainable Funding/Public Awareness)
3. Barriers to environmental investment.

In Tranche 1, EEPP addressed several policy reforms that focused mainly on institution strengthening. In Tranche 2, assistance to strengthen institutional capacity continues, though with lesser intensity. In general, and to the extent the availability of information allows, impacts of policy changes, whether related to EEPP assistance or through other initiatives are monitored using the overall general indicators discussed below.

F.2 EEPP Policy Measures

From a sectoral perspective, the analysis of the set of policy measures implemented in T1 of EEPP and the ones being addressed in Tranche 2 reveals the following major themes:

- Decentralization of environmental management operations
- Increase GOE capacity to integrate environmental issues/concerns in economic programs and development plans and provide environmental policy formulation and analysis
- Environmental funding mechanisms operational.

C.3 Overall Conclusions Based on Indicators

Governmental environmental investments have been substantially increasing over the past decade. Foreign funding is an important source for the broad environmental sector, especially for projects within the ministries of Housing, Water Resources, Local Administration, Energy and Electricity, and Health.

EEAA's share, though growing, is still marginal compared to other ministries. There is a need to activate EEAA's role in planning and coordinating the sector's investments. A good starting point is the NEAP.

The priorities of the environmental investments of the 5-year plan are mainly geared towards the improvement of basic environmental services, i.e. potable water, sanitation, and garbage collection. More than 70 percent of investments have been assigned to the provision of such services. Problems of air and water pollution caused by urban and

industrial expansion seem to have a lower priority and the costs for their control are shifted to the polluter. This situation calls for the activation of enforcement mechanisms and economic instruments.

F.4 INDICATORS

F.4.1 Background

Decentralization of environmental management (DEM) functions to regional, governorate, and local levels is a clearly identified policy of EEAA and, hence, of EEPP. For EEAA, this is symbolized by the establishment of eight Regional Branch Offices (RBOs), the plans to activate and upgrade the governorate level Environmental Management Units (EMUs), as well as the ongoing efforts to enhance the operational capacity of both entities.

The Tranche 2 policy approach to promote DEM by upgrading the EMUs to General Directorates of Environmental Affairs (GDEAs) is expected to enhance DEM; however, it will only relieve one of the constraints facing DEM. Other activities will be required to overcome the barriers making significant changes difficult. Some of these relate directly to the wider context of the Egyptian governance system, while others are specific to the environmental management (EM) sector. At present, MVE is investigating DEM overall through a special study (see study for conclusions drawn).

F.4.2 Decentralization of Environmental Management

Indicator F4.2.1 Index Number of EEAA Regional Branch Offices Operational and Performing Core Environmental Management Functions

Decentralization of responsibility allows better management of specific regional environmental issues.

The number of RBOs established is a proxy indicator for decentralization of environmental responsibilities from the national to the regional level within EEAA. EEAA is decentralizing environmental responsibilities by establishing eight regional branch offices (RBOs). Construction of the indicator recognizes that building an operational RBO is a multi-stage process. Therefore, the indicator identifies progress in stages, rather than only at the completion of a fully operational RBO. Specifically, progress is defined in seven stages, in keeping with the departments planned for each RBO:

1. Building is available and supplied with office equipment
2. Mini-chemical laboratory apparatus is operational to analyze at least 10 parameters
3. Director is appointed and in place

4. Environmental Awareness and Information Department is staffed (at least 2 persons)
5. Environmental Quality Department (including chemical laboratory staff) is staffed (at least 2 persons)
6. Environmental Management Department is staffed (at least 2 persons)
7. Finance and Administration Department is staffed (at least 2 persons).

The indicator assigns one point to each of these phases for each RBO. The value of the indicator is the sum of scores (between 0 and 7) across all RBOs, with the maximum score being 56. The following tables show an increase in the indicator over the period of study (1999–02), with achievements exceeding planned targets. This trend is expected to continue over the short and medium term, though at a decreasing rate.

Table 38 Number of New Staff Hired for RBOs

	Baseline Year 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Planned		21	25	25	26	30	35	39	44	51	56
Actual	20	29	38	33							

Data Source: Regional Branch Office Directorate of the Egyptian Environmental Affairs Agency (EEAA); USAID contractors during the period of USAID funding. Employment sheets of 28 May 02, EEAA.

Based on an EEAA Board of Directors' decision in 1998 adopting the amendments of the organizational structure of the RBO, the lab was merged in the Environmental Quality Department. Accordingly the lab staff are included among the Environmental Quality Department Staff and represented on the indicator chart under the Environmental Quality Department staff.

Table 39 Status of RBOs, 2002

RBO Location	Greater Cairo	Alexandria	East Delta	Canal Zone	Middle Delta	Red Sea	North Upper Egypt	South Upper Egypt	Total
Premises Available	1	1	1	1	1				
Equipped Mini Chemical Laboratory	1	1	1	1	1				
Functioning Branch Office Director	1	1	1	1	1				
Mini Chemical Lab									

RBO Location	Greater Cairo	Alexandria	East Delta	Canal Zone	Middle Delta	Red Sea	North Upper Egypt	South Upper Egypt	Total
Staff (min. 2 staff)									
Environmental Awareness and Information Department Staff (min. 2 staff)	1	1	1	1	1				
Environmental Qualify Department Staff (min. 2 staff)	1	1	1	1	1				
Environmental Management Department Staff (min. 2 staff)	1	1	1	1	1				
Finance and Administration Department Staff (min. 2 staff)	1	1		1	1				
Total	7	7	6	6	7				33

This indicator is useful for tracking development of the physical and human infrastructure needed for operating the RBOs. Combined with other indicators of environmental management operations, such as the one focusing on inspection, it could give a good picture of decentralization within EEAA. However, this indicator (as well as other indicators of this section) does not address decentralization to local levels, i.e. to EMUs.

Indicator F4.2.2 Allocation of EEAA Funds between Cairo and Regional Branch Offices (RBOs)

EEPP is working to encourage decentralization of EEAA's authority to implement environmental regulations. The magnitude of effort involved in properly implementing Law 4/1994 and its regulations is too great to be handled effectively from Cairo. Only by creating strong, well-staffed RBOs will the agency be able to keep track of regulated activities throughout the country.

In 1996,EEAA, with support from the Japanese Inter-Cooperation Agency (JICA), embarked on the implementation of a three-stage program to establish the eight RBOs, with EEAA covering the costs of construction and staffing and JICA providing the technical equipment for the chemical labs and training the lab staff. The first and second stages of the program resulted in the establishment of five RBOs and a central reference lab, with all operational by 2001. The total cost of these stages of the program was LE58 million, of which the EEAA share was slightly more than 40 percent. The third

and final stage of the program commenced during fiscal year 2000–01 and is planned for completion by the end of fiscal 2003–04. The total cost is estimated at LE35 million, of which the EEAA contribution will amount to LE15 million. During this stage, the three RBOs of North Upper Egypt (Assuit), South Upper Egypt (Aswan), and Red Sea (Hurghada) will be established.

Since 1997–98, the period during which allocation of funds for the construction and operation of EEAA RBOs could be monitored, the annual average actual investments in RBOs reached LE4.7 million in the physical construction phase (1997–2000) and LE8.3 million over the past 2 fiscal years. Total annual average actual investments of EEAA for the same periods amounted to LE32 and LE30 million respectively. This shows significant expenditures aimed at establishing RBOs and allowing them to begin operation. In summary:

- Actual expenditures for salaries in the EEAA budget grew from LE1.9 million in 1997–98 to LE4.5 million in 1999–2000, and reached LE6.8 million by 2001–02. The annual growth rate was more than 50 percent.
- Expenditures for other operation costs show the same trend, growing at a similar annual average rate from LE1.8 million in 1997–98 to LE4.4 million in 1999–2000, and reaching LE6.5 million by 2001–02.
- The growth of EEAA budget for investments, which funded more than 90 percent of the RBOs costs, showed a huge increase over the same period, from less than LE2.5 million in 1997–98 to LE26 million in 1999–2000 and LE43 million in 2001–02, with an annual average increase of 324 percent.

The magnitude of the increase in the EEAA budget over the study period contradicts concerns that allocation of funds for the RBOs has reduced funds available for the central office.

Table 40 Total Actual Expenditures of EEAA/RBOs 1997–98 through 2001–02 (LE1,000s)

Year	Total Actual Expenditures–RBOs				Total Actual Expenditures–EEAA			
	Budget Section				Budget Section			
	1	2	3	Total	1	2	3	Total
1997–98	na	na	5,700	na	1,916	1,802	2,382	6,100
1998–99	na	na	8,000	na	3,036	8,668	68,068	79,772
1999–2000	na	na	1,752	na	4,485	4,571	25,911	34,967
2000–01	na	na	5,800	na	5,000	4,400	17,000	26,400
2001–02	na	na	10,830	na	6,824	6,516	43,000	56,340
Total	na	na	18,382	na	21,261	6,516	156,361	203,579

Source: Calculated based on data from EEAA reports on final accounts for fiscal years from 1997–99 to 2001–02.

Indicator F4.2.3 Allocation of EEAA Staff between Cairo and Regional Branch Offices

Staff sustainability, and underlying staffing policy, is an important aspect of institutional strengthening. Analyzing present RBOs employment, in the context of overall EEAA employment, is useful to highlight how staff sustainability issues were considered in the staffing policies and weighed against issues of flexibility (ability to change staff).

From an administrative perspective, employees of GOE entities can be classified as shown below. The administrative powers of the employee vary from one group to another.

Permanent staff: (*moian* in Arabic) The employee is hired for a position in the organizational structure of the relevant governmental entity that is funded by Section 1 of the budget and follows certain legal procedures. All employment issues are regulated by special labor laws. The employees of this group enjoy all the administrative powers of their respective positions.

Seconded from other government entities: (*montadb* or *moar* in Arabic) The employee is a permanent staff member of a governmental entity. The employee has been "loaned" to another governmental entity on a temporary basis. The employee enjoys all the administrative powers of the position that he or she occupies.

Contracted staff: These are employees hired on a temporary base for a certain assignment. Their salaries are funded from Section 3 of the budget (investment projects). They have no administrative powers, especially in those issues involving comments to the government.

Advisory staff: These are specialists hired on a temporary basis to give advice in a certain field. They are paid an honorarium from Section 1 or 3 of the budget, and they have no administrative powers.

Growth in the number of RBO staff between 1997 and 2002 shows a pattern similar to the growth of RBO funds discussed above. Table 41 shows that RBO staff grew 8.8 times. The growth rate exceeded the growth of EEAA central staff. The staffing policy of EEAA over the study periods led to the increase of relative weight of RBOs staff to overall EEAA staff from only 3.1 percent in 1997 to 13 percent in 1999, and to about 21 percent in 2002. EEAA's commitment to the JICA program is one of the major factors explaining this growth. Taking into consideration the severe constrains on governmental staffing, it is clear that staffing of the RBOs was given priority over staffing of other departments of EEAA.

Table 41 Development of EEAA and RBOs Employment, 1997–98 through 2001–02

Year	Branch Staff	Total EEAA Staff	RBO Staff as a Percent of Total EEAA Staff
1997	11	357	3.1
1999	97	750	13
2002	218	1,059	20.6

Source: Calculated based on data from EEAA.

The significance of the analysis of the RBOs staffing pattern by hiring group lies in the specific mandate of the RBOs. RBOs are the executing arm of EEAA, which necessitates that their staff be capable of exercising administrative powers. Therefore, comparing the RBO staffing pattern with the overall EEAA staffing pattern shows whether staffing policies of EEAA recognize what is required to decentralize administration by empowering staff in the RBOs.

Table 42 presents a comparison between the staffing pattern of EEAA as a whole and the RBOs by hiring group. The table shows that the RBO staffing pattern has a higher percentage of permanent and seconded staff than EEAA—56.6 percent for RBOs compared with 39.8 percent for EEAA. The figures further show that contracted staff still make up a significant share of employment, though less for the RBOs than for EEAA overall.

Table 42 EEAA/RBOs Employment Structure by Hiring Group (May 2002)

	Permanent Staff	Seconded Staff	Contract Staff	Advisory Staff	Total
RBOs	113	10	94	1	218
Percent	52	4.6	43	0.4	100
EEAA	329	92	627	11	1059
Percent	31.1	8.7	59.2	1	100

Source: Calculated based on data from EEAA

From this analysis follows these conclusions:

- Staffing policies implemented over the last 5 years have taken into consideration the staffing needed to decentralize environmental management operations from EEAA central departments, in terms of RBO ability to exercise administrative powers essential to implement EEAA mandates.
- Constrained by limited Section 1 resources in the EEAA budget, EEAA senior management has made RBO development a priority over other EEAA departments.

Indicator F4.2.4 Number of Inspections by EEAA (disaggregated by Central/RBO)

In order to effectively implement Law 4/1994, EEAA must commit staff time and resources to inspect potentially polluting facilities and ensure that they are in compliance. Tracking the number of inspections carried out each year will give some sense of the agency's efforts to see that the law is implemented. It will also be useful to know which EEAA office (i.e. the central inspection unit or the RBOs) is conducting the inspections.

In order to monitor changes in EEAA inspection capabilities, data for inspections undertaken by economic activity and geographical location, and numbers of citations issued for non-compliance will be needed. The data also should identify who did the inspection (i.e. central inspection department, RBO, or jointly), in order to highlight decentralization issues within EEAA. In the longer term, data on inspections undertaken by EMUs, whether individually or jointly with RBOs, will make it possible to determine the degree of decentralization on a sectoral level.

An inspection unit was established in late 1999 in EEAA with 20 staff members. The unit gradually expanded its activities and was able to inspect around 350 industrial firms during its first year of operation (2000–01). Sixty percent of these were in the Greater Cairo Area, 30 percent in the Delta, 4 percent in Upper Egypt, 4 percent Alexandria, and 2 percent in the Suez Canal and Red Sea area).

Data about the economic sector and location of the facility inspected, and role of RBO in each inspection became available in September 2002. Until now, inspections are limited to industrial facilities.[6] Over the next 5 years, the inspection unit plans to expand its activities to include inspection of tourism, health, water, and sanitation facilities.

Prioritization for inspection of industrial firms was based on three criteria developed by the new unit, including:

- Pollution load
- Geographical location
- Potential impacts on water bodies and drainage.

These inspections were undertaken by the inspection unit, in cooperation with those RBOs operational at the time of inspection. Division of labor between the central inspection unit and the RBOs has been that measurement technicians and their equipment are provided by the regional lab, while inspection itself has been undertaken by the inspection unit staff. In this way, the inspection unit staff provides on-the-job training to the accompanying RBO.

[6] In addition to inspecting industrial facilities, the inspection unit has been called upon to inspect other activities on an *ad hoc* basis, including the burning of rice straw by farmers in the Nile Delta.

F.4.3 Investment, Expenditure, Resources, and Employment

Indicator F.4.3.1 Planned Government Investment In Environmental Protection

These types of indicators help in highlighting the importance that society gives to environmental protection and the ranking of environmental issues on the political socio-economic agenda, as manifested by their share in investment resources. A breakdown between government and donor contribution within this category will provide further sense of level of commitment and extent to which the country's environment program is subject to changes in donor preferences.

Data on planned government investment is available in an overall magnitude for the third 5-year plan (1992–93 through 1996–97) and in more details in the fourth 5-year plan for Social and Economic Development (1997–98 through 2001–02), which have a cross-cutting section called "environment." How this category is exactly defined and what are the demarcation lines between an environmental project and a non-environmental one, remain unspecified in both plans, and this needs a close investigation. However, the significance of the available information for this report is evident.

According to the data for both plans, the planned investments grow dramatically from LE1.6 billion (000 million) for the period 1992–93 through 1996–97 to LE26.4 billion for the planning period 1997–98 through 2001–02, or from nearly LE30 million in the period 1992–93 through 1996–97 to around LE5.3 billion in l996–97 through 2001–02.[7]

The fourth 5-year plan (1997–98 through 2001–02) data on environmental investments are in a degree of detail that allowed an analysis of more depth:

- Share of environmental investments to total planned investments (6.6 percent) ranked seventh compared with the other 17 economic and services sectors, excluding defense. Environmental investments were less than shares of:
  - Industry (23 percent)
  - Housing (14.2 percent)
  - Transport, communications, and storage (10.7 percent)
  - Tourism (8 percent)
  - Agriculture (7.7 percent)
  - Petroleum (7.7 percent)
  - Electricity (7.2 percent).
- Investment share of the environmental sector was followed by the shares for utilities (4.6 percent), irrigation (3.8 percent), education (3.7 percent), health

[7] Ministry of Planning, third 5-year plan, volume 1, p. 581 and fourth 5-year plan, volume 3 part 2, p.1782-1794.

(2.2 percent), trade (2.2 percent), and contractors, Suez Canal, finance, and insurance (with shares less than 2 percent each).[8]

Table 43 presents planed government environmental investments for the period 1997–98 through 2001–02, grouped according to the implementing governmental body (i.e. ministries and affiliated services and economic bodies). Unfortunately actual expenditures were not made available for this report. It is hoped to that such figures could be included in the future.

Table 43 Planned Governmental Environmental and Total Investments

Ministry	Environmental Investments (LE)						Total Investments (LE)	Environmental Investment as a Percent of Total Investment
	Local		Foreign		Total			
	LE	Percent	LE	Percent	LE	Percent	LE	Percent
Agriculture and Land Reclamation	82210	56.69	62818	43.31	145028	0.55	5305.000	2.70
Public Works and Water Resources	1588849	72.06	616000	27.94	2204849	8.34	14786.700	14.91
Petroleum	1455000	93.57	100000	6.43	1555000	5.89	11105.000	14.00
Energy and Electricity	282600	55.81	223800	44.19	506400	1.92	8805.700	5.75
Transportation	2251626	99.34	15000	0.66	2266626	8.58	15172.500	14.94
Housing, Utilities and New Urban Communities	11503760	86.45	1803100	13.55	13306860	50.36	18567.300	71.67
Health and Population	116000	40.14	173000	59.86	289000	1.09	5113.000	5.65
Education	17000	100.00	0	0.00	17000	0.06	12167.200	0.14
Culture	1000	100.00	0	0.00	1000	0.00	499.900	0.20
Tourism	11400	69.09	5100	30.91	16500	0.06	764.600	2.16
Military Production	33000	100.00	0	0.00	33000	0.12	2257.000	1.46
Ministers Cabinet	75400	65.34	40000	34.66	115400	0.44	496.000	23.27
Local Administration	5381787	90.21	584370	9.79	5966157 (EEAA)	22.58	8157.100	73

[8] Ministry of Planning, fourth 5-year plan, volume 2, table 40, p.187.

Ministry	Environmental Investments (LE)						Total Investments (LE)	Environmental Investment as a Percent of Total Investment
	Local		Foreign		Total			
	LE	Percent	LE	Percent	LE	Percent	LE	Percent
Total–ministries environmental investments	22799632	86.29	3623188	13.71	26422820	100.00	103197.000	25.60
Total governmental investment	na		na		na		116225.8	
Total governmental and non-governmental investment	18900000	95.27	381100000	4.73		100	400000	6.6

Source: 5-Year Economic and Social Plan (1997–98 through 2001–02), Ministry of Planning, April 1997. (Environmental Investments, volume 3 part 2. For other data, volume 2, table 42 and 44, pages 189–192.).

The funds allocated by the 4th Economic and Social Plan to the environmental sector were distributed among 13 of 35 implementing governmental entities. These are entities that are mandated with either protection of the environment (such as ministries for Water Resources, Agriculture, Housing & New Urban Communities, and Environment), and/or the improvement of the provision of basic environmental services, i.e. potable water, sanitation, and public cleanliness, (such as ministries for Local Administration and Health).

The funding for the environmental sector is highly concentrated at the ministerial level, with two ministries—Housing and Local Administration—having more than 70 percent of total funds, with the share of the latter almost half the share of the former. The share of the ministries of Transport and of Water Resources came next, amounting to about 8 percent each, with Petroleum and Electricity & Energy following at 6 percent and 2 percent, respectively. The remaining six ministries had shares of 1 percent or less, and EEAA had a share of only 0.44 percent. This pattern of investments reflects the division of labor in the environmental sector, where line ministries are mandated with implementation and EEAA is responsible for monitoring, planning, and coordination. EEAA might have a role in coordinating the investments for the environmental sector for all ministries.

On average, the share of foreign funding sources for governmental environmental investments follows the same pattern. It shows the total investments of the plan reaching

more than 13 percent. From a ministry-by-ministry approach, the situation is significantly different. Three ministries (Health, Energy, and Agriculture) receive more than three times the average; the ministries of Tourism and Water Resources and EEAA receive twice the average figure. The distribution of foreign funding resources reveals high concentration in the ministries of Housing (50 percent), Water Resources (17 percent), Local Administration (16 percent), Energy and Electricity (6 percent), and Health (5 percent). These ministries receive more than 90 percent of the funding among the 13 ministries with environmental projects. EEAA ranked eighth, with a share of only 1 percent.

As mentioned above, numbers on actual expenditures were not available, nevertheless data for EEAA presented in table 44 shows that actual expenditures (from table 40) during the 5-year plan (1997–98 through 2001–02), were nearly double the planned investments.

The environmental component is of major significance for EEAA, and the ministries of Housing, Utilities, and New Urban Communities and of Local Administration, as it represents 100, 72, and 26 percent of all their planned investments in the 1997–98 through 2001–02 plan.

Analysis of the allocation of the planned environmental investments within each ministry, as much as the breakdown of data allows, will help in taking a much deeper look into the investment pattern and its priorities.

Table 44 Planned Investments by Ministries and Agencies, 1997–98 through 2001–02

Ministry	LE000	Percent
1. Ministry of Agriculture and Land Reclamation		0.55
Headquarters	128,628	89
General Organization for Fisheries Development	16,400	11
Sub-total	145,028	100
2. Ministry of Public Works and Water Resources		8.34
Headquarters	25,000	1
Irrigation Organization	393,334	18
034001 General Authority for the High Dam and Aswan Storage	22,495	1
034002 Egyptian General Organization for Drainage	1,615,150	73
034003 National Water Research Center	7,570	0
034005 Egyptian Agency for Protecting Coasts	141,300	6
Sub-total	2,204,849	100
3. Ministry of Petroleum		5.89
056001 Egyptian General Petroleum Corporation	14,000	1
057101 General Petroleum Company	20,000	1
057201 Alexandria Petroleum Company	375,000	24

Ministry	LE000	Percent
057202 Suez Company for Petroleum Production	60,000	4
057204 Cairo Company for Petroleum Refining	6,000	0
057205 El Ameria Company for Petroleum Refining	15,000	1
057301 Egyptian Petrochemical Company	25,000	2
057403 Petroleum Gas Company	1,020,000	66
057501 Petroleum Pipes Company	20,000	1
Sub-total	1,555,000	100
4. Ministry of Energy & Electricity		1.92
061002 Atomic Energy Authority	40,750	8
066003 Authority for Constructing Hydropower Stations	61,650	12
066005 New and Renewable Energy Authority	404,000	80
Sub-total	506,400	100
5. Ministry of Transportation		8.58
71001 Headquarters	47,500	2
071003 Ports Authority	10,518	0
074005 National Authority for Subways	2,100,000	93
076001 National Authority for Egypt's Railways	50,000	2
076005 General Authority for Red Sea Ports	27,857	1
076007 General Authority for Port Said Port	2,921	0
076008 General Authority for Damietta Port	27,240	1
076009 Cairo Air Port Authority	590	0
Sub-total	2,266,626	100
6. Ministry of Housing, Utilities & New Urban Communities		50.36
141003 Executive Authority for Greater Cairo Sanitary Drainage	2,165,000	16
141201 National Organization for Developing Greater Cairo	899,000	7
141203 Authority for Developing Alexandria and Northern Coast	323,500	2
141204 Authority for Developing Sinai	741,100	6
141205 Authority for Developing New Valley	67,150	1
141206 Authority for Developing Red Sea	272,500	2
144001 National Organization for Potable water and Sewage Disposal	7,050,500	53
146102 Minia New City	40,700	0
146103 Assuit New City	135,00	0
146104 New Tyba	22,500	0
146105 El Obor City	90,000	1
146106 6 October City	158,000	1
146107 Badr City	44,500	0
146108 10th of Ramadan City	256,000	2
146109 El Sherouk City	58,500	0

Ministry	LE000	Percent
146110 Sheik Zayed District	50,600	0
146111 First District	125,000	1
146112 Fifth District	91,000	1
146113 El Katamya District	60,000	0
146114 Qena City	9,000	0
146115 Sohag–Akhmem City	30,000	0
146116 El-Fayoum City	18,500	0
146117 Aswan New City	13,000	0
146118 Technology Valley	22,500	0
146119 15 May City	61,400	0
146120 Sadat City	138,600	1
146121 Salheya New City	80,800	1
146122 Borg el-Arab New City	114,200	1
146123 El-Noubaria New City	50,100	0
146124 Domyat New City	113,910	1
146125 Domyat Port Services	28,500	0
146126 Beni Suef New City	77,300	1
Sub-total	13,286,860	100
7. Ministry of Health and Population		1.09
161001 Headquarters	277,000	96
164001 General Authority for Hospitals and Educational Institutes	12,000	4
Sub-total	289,000	100
8. Ministry of Higher Education and Scientific Research		0.06
204008 Cairo University	8,000	47
204018 Suez Canal University	9,000	53
Sub-total	17,000	100
9. Ministry of Culture		0.00
234004 General Authority for Culture Deficiency	1,000	100
Sub-Total	1,000	100
10. Ministry of Tourism		0.06
241001 Headquarters	5,500	33
Tourism Development Authority	11,000	67
Sub-total	16,500	100
11. Ministry of Military Production		0.12
277102 Aha Company for Chemical Products (Factory 270)	20,000	61
277309 Helwan Company for Instruments & Equipment (Factory 999)	13,000	39
Sub-total	33,000	100
12. Ministers' Cabinet Secretariat		0.44
551006 Egyptian Environmental Affairs Agency	115,400	100

Ministry	LE000	Percent
Sub-total	115,400	100
13. Ministry of Local Administration		22.58
561001 General Secretariat for Local Administration	220,000	4
561002 Organization for Restructuring and Development of Egyptian Villages	300,758	5
562101 Cairo Governorate Headquarters	341,760	6
562102 Alexandria Headquarters	128,240	2
562103 Port Said Headquarters	71,640	1
562104 Ismailia Headquarters	66,500	1
562105 Suez Headquarters	29,240	0
562106 El-Qualubeya Headquarters	163,340	3
562107 El-Sharkia Headquarters	80,240	1
562108 El-Dakahlia Headquarters	109,740	2
562109 Domyat Headquarters	47,340	1
562110 El-Menofia Headquarters	62,040	1
562111 El-Gharbia Headquarters	91,740	2
562112 Kafr el-Sheikh Headquarters	74,040	1
562113 El-Behira Headquarters	77,240	1
562114 El-Giza Headquarters	177,060	3
562115 El-Fayoum Headquarters	120,240	2
562116 Beni Suef Headquarters	115,054	2
562117 El-Minia Headquarters	107,340	2
562118 Assuit Headquarters	124,295	2
562119 Sohag Headquarters	114,740	2
562120 Qena Headquarters	83,240	1
562121 Aswan Headquarters	53,240	1
562122 Matruh Headquarters	32,320	1
562123 New Valley Headquarters	49,740	1
562124 Red Sea Headquarters	—	0
562125 North Sinai Headquarters	29,840	1
562126 South Sinai Headquarters	29,290	0
562127 Luxor City	55,240	1
564003 General Authority for Cleaning Cairo	70,000	1
564004 General Authority for Cleaning Giza	30,000	1
566003 General Organization for Potable water in Cairo	600,000	10
566004 General Organization for Potable Water, Alexandria	261,000	4
566005 General Organization for Sanitary Drainage, Cairo	832,920	14
566006 General Organization for Sanitary Drainage, Alexandria	500,000	8
566007 Egyptian A48 General Authority for Drinking Water and Drainage, Aswan	71,000	1

Ministry	LE000	Percent
566008 National Organization for Potable Water and Sewage Disposal, Minia	99,000	2
566009 National Organization for Potable Water and Sewage Disposal, Beni Suef	67,500	1
566010 National Organization for Potable Water and Sewage Disposal, Fayoum	67,000	1
566011 National Organization for Potable Water and Sewage Disposal, Dakahlia	147,000	2
566012 National Organization for Potable Water and Sewage Disposal, Gharbia	90,000	2
566013 National Organization for Potable Water and Sewage Disposal, Sharkia	140,000	2
Sub-Total	5,930,917	100
Total	26,422,820	

Source: 5-Year Economic and Social Plan (1997–98 through 2001–02), Ministry of Planning, April 1997. (Environmental Investments, volume 3 part 2, pages 1782–1794.)

The Ministry of Housing, Utilities, and New Urban Communities' share of total governmental environmental investments—50 percent—of which 70 percent is allocated for potable water and sanitation projects in new urban communities and 30 percent for similar projects needed because of growth in old urban centers, reflects the planners' intention to address the environmental problems of the old valley mainly through urban–industrial expansion in Egypt's deserts, which is and will remain a basic challenge for the next decades.

The Ministry of Local Administration's share—22.5 percent of the total, which funds governorate projects—was allocated as follows: 47 percent for sanitation and potable water, 45 percent for institutional strengthening projects in governorates, and only 2 percent for public cleanliness in Cairo and Giza. This shows the intention of the plan to provide more for the improvement of basic environmental services in old urban centers and rural areas.

Most of the Ministry of Public Works and Water Resources' share—8.3 percent of the total governmental allocations to environmental investments—was allocated to water conservation projects(73 percent for projects that covered drainage canals), while 93 percent of the Ministry of Transportation's share was allocated to the Cairo Subway Authority. The Ministry of Petroleum allots 66 percent of its share (5.9 percent of the total investment) to its affiliated Petroleum Gas Company, and the Ministry of Energy and Electricity assigned 80 percent of its share (1.9 percent of the total investment) to new and renewable energy projects.

Indicator F.4.3.2 Actual Government Expenditure in Environmental Protection

Data on real expenditures and their comparison with planned ones would enable the system to monitor the tradeoffs of decision makers in terms of investing in environmental protection versus other investment fields in the real, not the ideal, situation.

Unfortunately, such data are not readily available to MVE, with the exception of overall data for EEAA. The planned MVE study on governmental investments in the environmental sector should provide more information on this.

Indicator F.4.3.3 Environmental Protection Fund Revenue by Source

The EPF is still EEAA's major source of funding, accounting for considerably more than routine budgetary resources. Because of this fact and the fact that the plan is for the EPF to fund many other activities in the environment, analyzing revenue is important. To an extent, where it comes from may also influence where it goes.

Law 4/1994 authorizes a number of revenue sources for EPF, namely GOE budget allocations, grants and donations, fines, and financial resources of the Protectorate Fund authorized under Law 102/1983. Additionally, the EPF can receive funds in both LE and in hard currency, i.e., US dollars. One major goal of EEPP is to increase the revenues available to the EPF and to diversify its sources, so that there will be more resources available to address environment problems. Expansion of the EPF revenue base should enable the Fund to attain high-level performance and enhance its ability to leverage private sector investments in environment.

In T1, EEPP supported EEAA efforts towards enhancing EPF revenues, and setting effective and transparent procedures for the Fund. Starting in T1, options were being identified to enhance potential financing available through EPF for environmental projects. During T2, the EEAA Board of Directors will adopt selected revenue enhancement mechanisms and secure necessary GOE approvals. Initial steps will be undertaken to implement the adopted mechanisms during T2.

From a monitoring perspective, it is important to track how much money the fund has and where it comes from. An increase in EPF revenues, all else being equal, should therefore be evidence that the project is accomplishing its goal, and it should be positively considered. However, this assumes that funds are not simply being diverted into the EPF from other funding sources. That would not increase the size of the overall pie but might change the rules for how the money is spent.

It also assumes that increases in all of the revenue sources are in fact a good thing. For example, about 40 percent of the revenues in the EPF in 2000–01 came from penalties and compensation for damages. If this increases, it could mean that (1) the system for law enforcement is improving, or (2) the penalties and compensation required have increased to better reflect the value of the damage done, or (3) more harm is being done to the environment. The first two would generally be a good thing, the third would not.

Analysis of the EPF revenue data for the period from its establishment in 1995 through May 2001 as presented in table 45 shows the following:

Table 45 EPF Revenues 1995–May 2001

Description	Revenue in LE	Revenue in US $
Revenues since establishment to June 1997	26,476,643.64 (8.8 annual average)	1,766,806.43 (0.6 annual average)
Revenues Fiscal Year 1997–98	5,523,093.76	5,476,371.55
Revenues Fiscal Year 1998–99	8,236,159.62	785,353.72
Revenues Fiscal Year 1999–2000	9,730,058.39	957,565.00
Revenues Fiscal Year 2000–May 2001	9,849,174.5	890,114.59
Total revenues up to May 2001	LE59,815,129.91	$9,876,211.29

Reference: Environmental Protection Fund/ EEAA

The total accumulated revenues of the EPF since its establishment through May 2001 amounted to nearly LE60 million and US$10 million (equivalent to almost LE40 million at the time) with an average annual revenue of LE8.5 million and US$1.4 million (equivalent to LE5.6 million).

Revenues in US$ are on average 40 percent of total EPF revenues and their average annual increase is 4 times that of LE revenues (1.75 for the latter and 7 percent for the former).

Compared to the revenue sources mentioned in the law, several ways to enhance the revenues seems worth investigating, especially those related to GOE budget allocations, fines, and compensations for damages.

Analysis of the structure of EPF revenue as represented by the data for 2000–01 and tabulated in tables 46 and 47 reveals the following:

Table 46 Environmental Protection Fund LE Revenues by Source July 2000–June 2001

Source of Funding	Revenue in LE	Percent of Total Revenues
Aid and donations (revenue from glass boxes in airports and hotels)	165,000.73	1.2
Fines and compensations for damages	7,577,650.75	57.4
Services charges (using river moorage)	75,090.00	0.5
Hunting charges (ducks and *Apus*)	111,676.80	0.8
Charges for use of protectorates	53,827.03	0.4
Concession fees—protectorates	183,620.00	1.4
Visiting charges—protectorates	4,853,805.48	36.7
Other revenues (Environment trade fair)	193,873.49	1.5

Sub-total Revenues	13,214,544.28	

Table 47 Environmental Protection Fund US$ Revenues by Source July 2000–June 2001

Source of Funding	Revenue		Revenue Equivalent in LE**
	$	Percent	
Donations	1,628.00	0.2	6,267.80
Penalties and compensation for damages	44,000.00	4.1	169,400.00
Bank Interests	478,315.19	44.4	1,841,513.48
Protectorates entry fees	552,709.00	51.3	2,127,929.65
Sub-Total Revenues	1,076,652.19	100	4,145,110.93
Total Revenues in LE			17,359,655.21

** Rate: 1.00 $ = 3.85 LE

Reference: PSU/EEPP, "Assessment of Existing EPF Revenue Sources and their Potential for Development and Enhancement," 2nd Draft Report, October 2001, Table 2.2, p.2–7.

Two kinds of EPF revenues—penalties and compensation for damages and Protectorate entry fees—made up more than 94 percent of the total revenues in LE and 55 percent of the US$ revenues.

Despite the fact that Law 4/1994 does not allow EPF resources to be invested, bank interest generates 44 percent of the total EPF revenues in US$. This was not the case for LE, where bank interest did not play any role. The reason behind that could lay in the work procedures of the EPF where the Ministry of Finance granted the holding of deposit accounts for penalties and compensation of damages paid in hard currency.

Analysis of expenditures from the EPF funds will help in tracking the progress made in changing the EPF from being EEAA's major source of funding to become a funding source for the entire environmental sector. Table 48 presents EPF expenditures for 2000–01. From the table the following is evident:

- Outlay to support EEAA's budget in 2000–01 amounted to 75 percent of total EPF expenditures compared to more than 90 percent in the late 1990s.
- Costs for enhancement and collection of the EPF revenues were only 0.11 percent of total expenditures, indicating a possible field for action to enhance the revenues.
- EPF has invested around LE6,000 in organizing exhibitions and conferences and made LE194,000 out of these activities. In spite of the donor contribution to the costs of these activities, the organization of such activities seems a promising revenue source.

Table 48 EPF Expenditures, FY 2000–01

Expenditure Type	LE	Percent
Salaries and Bonuses	145,300.71	1.81
Meetings Honorarium	1,800.00	0.02
Medical Services EEAA (In return for Revenue Collection)	33,837.57	0.42
Support to EEAA Infrastructure (First Section)	1,211,777.16	15.09
Sub-total Expenditures (First Section)	1,392,715.44	17.35
Administration and General Payments	4,676.95	0.06
Expenditures for Improving the Funds Revenue	640.00	0.01
Expenditures for Revenue Collection from Foreign Associations	7,665.00	0.10
Expenditures of the International Environment Exhibition	5,970.00	0.07
Expenditures for Environmental Crisis	11,700.00	0.15
Support to EEAA Infrastructure (Second Section)	577,406.36	7.19
Support to EEAA Projects (Third Section)	4,166,633.78	51.90
Sub-total Expenditures (Second Section)	4,774,692.09	59.47
Total EPF Expenditures for the FY 2000–01	6,167,407.53	76.82
Expenditures for Environmental Crisis in US$ (US$ = 3.85 LE) $483,389.70	1,861,050.35	23.18
Total EPF Expenditures for the FY 2000–01	8,028,457.88	100.00
Due Expenditures for FY 2000–01		
Expenditures for Revenue Collection	1,283,115.36	
Expenditures for Environmental Crisis	868,795.82	
Support to the Pilot Phase Projects	2,000,000.00	
Total	4,151,911.18	

Indicator F.4.3.4 Government Employment in Environmental Protection

This information complements data on government investment in the environment, and is an important way to assess whether environmental policy is likely to be effectively implemented.

Estimating government employment and expenditure on the environment is difficult, because it is not clear what should be considered "environmental." Some items are easy to classify; thus all EEAA expenditures and employment are considered environmental, as are all resources devoted to trash handling, drinking water supply, and sewage collection and treatment. Items that are harder to allocate are water resources

management, energy management, public health, forest management, and agriculture. In doing this, the monitoring system should follow the approaches being developed in the development of environmental accounts in Europe and elsewhere, so that the resulting data will be compatible with that being developed elsewhere in the world.

The allocation principles used to classify expenditures and employment will be the same; for this reason, both kinds of information are being discussed together. As the data are developed, the sources of the funds should be identified as well, distinguishing in particular routine government budgetary resources, other government funds (e.g. fees and fines), donor support, and other sources.

Data on EEAA employment are available and were analyzed under the indicator on decentralization. Comparing the annual percentage increase of EEAA employment with that for the total employment of the government and public sectors for the period 1997–02 reveals the huge increase of the former—EEAA—(around 40 percent annually) compared with the GOE on the whole (2.2 percent annually).[9] More analysis could be undertaken if more detailed data on the government employment were made available.

Data on employment within the EMUs could be extracted from data that were collected recently by the PSU on EMU organizational status. Compared with the same data from previous years as well as other related data (EEAA RBOs, total respective governorate employment) useful information could be obtained.

Indicator F.4.3.5 Number of Accredited Environmental Laboratories

Presently there are no laboratories in Egypt that are accredited by an international laboratory accreditation council, such as the International Laboratory Accreditation Cooperation (ILAC) or the Asian-Pacific Laboratory Accreditation Council (APLAC). In Tranche 2, EEPP is providing technical support to assist the Egyptian Accreditation Council (EGAC). This will eventually lead to EGAC's accreditation being acceptable worldwide, thereby lowering costs of laboratory testing. The technical assistance provided under EEPP T2 will help EGAC in gaining experience accrediting select environmental laboratories; passing an external friendly audit; and submitting a membership application to ILAC or APLAC. Technical assistance will also support two to three laboratories through the accreditation process by EGAC, including the EEAA Central Laboratory. Table 49 illustrates plans for accrediting environmental laboratories.

[9] EEAA employment developed as follows: 357 in 1997, 750 in 1999, and 1,059 in 2002. According to data from the reports on Egypt: Human Development of 1998–99 (page 98) and 2000–01 (page 138), the total employment of the government and public sector were estimated as follows: 18.9 million in 1997, 19 million in 1999, and 21 million in 2002.

Table 49 Number of Accredited Environmental Laboratories

	Baseline Year 2001	2002	2003	2004	2005	2006	2007	2008	2009
Planned			1	3	5	—			
Actual									

Note: The figures above are entirely illustrative. Actual targets and accomplishments will be discussed with the Strengthening Egypt's Accreditation System (SEAS) project.

F.4.4 Other

Indicator F.4.4.1 Percent Of Policy Reform Tranche Values Achieved

This indicator is the percent of the total tranche value disbursed based on verified GOE achievement of the corresponding portion of the policy reform package. Thus, it will reflect environmental policy change resulting from the work of the EEPP. The MOUs for each tranche of each program define a set of reforms of policies, regulations, norms, and standards designed to improve ENR management. The reforms are associated with cash disbursement from USAID to the GOE. The magnitude of the cash disbursements for each policy reform is also related to factors such as the significance and difficulty of the particular reform. At the end of each tranche these are verified as achieved or not achieved. Tranche periods differ in length and years covered and do not correspond to fiscal or calendar years. This factor, combined with the time required for verification and USAID certification, introduces a "lag time" between actual implementation of reforms and results reporting.

The indicator assumes that percent of the tranche achieved is a direct measure of how well the GOE has performed in achieving the reforms of policies, regulations, norms, and standards to which it agreed. It also assumes that the policy reform package and its successful implementation are directly affected by the technical assistance that USAID provides.

The EEPP currently is planned to have two tranche periods consisting of 22, and 27-months duration. These correspond to the following periods respectively: (a) June 1999–March 2001, and (b) April 2001–June 2003. Data will be collected when achievement of the reforms is verified by the MVE and when USAID certifies these for disbursement. (Note: actual funds disbursement will happen later.) Interim period disbursements in EEPP will allow program management to closely monitor progress over each tranche and provides an incentive to the GOE implementing agencies.

The indicator of percent of the tranche achieved in a given tranche period will be reported in approved verification reports. The value of the indicators will be taken directly from the reports. "Achieved" is verified as having been accomplished for cash disbursement purposes.

Data are collected from approved verification reports and entered directly into the Performance Monitoring Plan or PMP. Data on specific policy achievements are used by GOE and USAID for management of policy reform programs and for planning of subsequent tranche policy reform programs. Table 50 shows very preliminary data for this indicator.

Table 50 Percentage of Tranche Achieved in EEPP (2000–04) and PEP (2005–10)

	Baseline Year 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Planned			70 (T1)		100 (T2)						
Actual	0		85 (T1)								

Data Source: USAID SO 19 team and the MVE unit. The data are based on the achievements of GOE partner agencies: EEAA, TDA, EGAS, and others, as relevant.

The GOE commitment to a strong ENR framework will be reflected in the extent to which it completes these actions. The percentage of the tranche value achieved will better capture the priority and magnitude of policy change because more important reforms can be weighted more heavily. (EEPP Tranche 1 does not weight policies based on difficulty and importance but this weighting is incorporated in tranche 2.) Targets may be zero for those years when no tranche is completed though interim verification and disbursement will allow for closer program monitoring. To the extent that they are included in the percentage of the tranche cash awarded measures that are partially met will be taken into account.

In 2001, USAID and GOE agreed to modify EEPP's schedule, whereby the Project Completion Assistance Date or PACD is extended to the end of FY2003; and Tranche 2 until June 2003 and considered the final tranche. (Subsequent inclusion of Supplemental MVs will be taken into account in this indicator.)